HOUSE OF LORDS SESSION 1993–94

SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

DEFENCE RESEARCH AGENCY

ORAL AND WRITTEN EVIDENCE

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CALL FOR EVIDENCE

The House of Lords Select Committee on Science and Technology have appointed a Sub-Committee, under the chairmanship of the Earl of Selborne, to enquire into the Defence Research Agency (DRA).

The Sub-Committee invite written submissions on any matters relevant to their terms of reference and in particular on the following questions. It may be that not all the questions will be relevant to your concerns, in which case you should be selective.

1.The Defence Research Agency and its relationship with the MoD

1.1 How independent of the MoD is the DRA?

1.2 Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as provider to the MoD of the best quality research?

1.3 How does the DRA's status affect its research strategy?

1.4 How has the MoD's system of Research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading Fund Status?

1.5 How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?

1.6 How is the process of formulating a strategy for the DRA being affected by the new thinking about defence and foreign policy following the end of the Cold War? Among the factors that might have to be taken into account are:

— the shift in focus of defence policy from the East-West confrontation towards more localised conflicts such as the Gulf, Somalia and the former Yugoslavia, together with concern about proliferation of weapons of mass destruction, with possible consequent changes in equipment requirements;

— the combination of downward financial pressure on the defence budget and upward pressure arising from the desire to incorporate ever newer technology into military equipment;

— the effect of State sponsored and other forms of terrorism on the roles and equipments of our Armed Forces;

— the question of how, in such circumstances, to determine which are the technological capabilities that must be retained within the UK in general, and the DRA in particular.

1.7 The DRA, like its predecessor organisations, has as its primary role the provision of research services to the MoD. In the past, however, the defence research establishments have also provided other (non-research) scientific and technical services to the MoD (significantly so during the Falklands and Gulf conflicts), as well as to other Government departments and private customers. How far should the DRA continue to provide such services, and to whom?

2. The DRA's management, internal affairs and corporate strategy

2.1 Will planned restructuring and rationalisation affect excellence, or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?

2.2 Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting-up of the agency?

2.3 What are the implications of the new regime's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?

2.4 Pathfinder is the DRA's programme to allow private companies to gain access to research at a much earlier stage and to contribute ideas which align with their in-company, possibly civil, research programmes. The projected advantages of Pathfinder include more value for money by prevention of duplication of research and improving take-up of promising ideas, and providing companies with the earliest opportunity to develop their ideas thus improving their wealth-creating potential. Is the programme worthwhile? If so, does it need refining and how can it be improved?

2.5 How does the DRA identify future defence needs, and is its method of identifying such needs properly thought out?

3.The DRA's relations with industry, Europe and the wider world

3.1 Is enough being done to link the DRA's defence-orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?

3.2 What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?

3.3 How does the DRA connect to the Technology Foresight exercise being conducted by the OST?

3.4 How effective are the DRA's links with the DTI, and is there too little DRA involvement in the DTI's LINK scheme?

3.5 Has the DRA effectively filled the void left by the demise of Defence Technology Enterprises, and is the DRA any more likely to succeed where DTE failed?

3.6 What is to be the DRA's role in the issues of conversion and diversification in the defence industry as a whole?

3.7 How should it relate to the part of industry which is not concerned with defence and how much should it focus on dual-use research?

3.8 How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?

3.9 What kind of relationship exists with the EC Framework Programme and other European (including non-EC) programmes, such as EUCLID and EUREKA?

3.10 Does the DRA seek European collaboration as a matter of course?

3.11 Is there in other countries anything relating to the management of defence research from which the United Kingdom could learn?

INSTRUCTIONS TO WITNESSES

Evidence should be submitted to me, the Clerk of Sub-Committee II (Defence Research Agency), Select Committee on Science and Technology, House of Lords, London, SW1A OPW by Monday, 10 January. Evidence must be clearly typed or printed on one side of A4 paper and take the form of an original copy. It would assist the Sub-Committee if evidence were prefaced with an executive summary or precis. Evidence becomes the property of the Committee, and may be printed. You may publicise your evidence between submission and publication, but in doing so you must indicate that it was prepared for the Committee.

On the basis of written evidence received the Committee will invite some witnesses to give oral evidence.

You may follow the progress of the enquiry from the Weekly Agenda of House of Lords Select Committees. This is free, and may be ordered from Miss Sue Hunt, Committee Office, House of Lords, London SW1A OPW, telephone 071 219 5791.

Further information from the Clerk, David Batt, House of Lords, London SW1A OPW, telephone 071 219 6075; direct line 071 219 3055; fax 071 219 6715.

22 November 1993

HOUSE OF LORDS SESSION 1993-94

MINUTES OF EVIDENCE
TAKEN BEFORE

THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

(SUB-COMMITTEE II DEFENCE RESEARCH AGENCY)

Thursday 20 January 1994

MINISTRY OF DEFENCE

Mr M J V Bell, Dr G G Pope and Sir Roger Austin

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MINUTES OF EVIDENCE

TAKEN BEFORE THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

THURSDAY 20 JANUARY 1994

Present:

Chorley, L.	Renwick, L.
Craig of Radley, L.	Selborne, E. (Chairman)
Hilton of Eggardon, B.	Trefgarne, L.
Platt of Writtle, B.	Dainton, L.
Redesdale, L.	

Memorandum submitted by the Ministry of Defence

In response to your letter of 22 November I attach at Annex the MoD's answers to the questions on the DRA and its relationship with the MOD; the DRA's Management, internal affairs and corporate strategy; and the DRA's relationships with industry, Europe and the wider world.

Our response encapsulates the views of the DRA, but not those of external members of the Defence Research Agency Council or the Defence Scientific Advisory Committee who are, of course, necessarily independent of the Ministry of Defence.

1. The Defence Research Agency and its relationship with the MoD

1.1 *How independent of the MoD is the DRA?*

As a Trading Fund, The DRA is no longer funded directly on the MoD votes for its research programme but instead must recover the full cost of its operation from its customers—90 per cent of which are individual budget holders in the Ministry of Defence. A considerable amount of effort and preparation has gone into ensuring that the DRA operates at arms length from its principal customers so that the disciplines and benefits of a proper customer-supplier relationship can be realised. Although MoD and DRA cannot enter into legally binding contracts with each other, the MoD places quasi-contracts on DRA which are, as far as practicable, indentical to MoD's standard commercial conditions of contract. The DRA for its part is required to deliver to the time, price and quality specified in the 'contract' and an element of the payment is linked to satisfactory completion of the work.

Notwithstanding this customer-supplier relationship, the DRA does still belong to the Secretary of State for Defence and the scope and manner of its operation are constrained by the provisions of its Framework Document. For example, it cannot develop or produce equipment for the MoD, other than laboratory prototypes, except when explicity authorised to do so by the Secretary of State; and, when undertaking work for non-Exchequer customers, it must both have regard to wider security and political considerations and also conform with MoD guidelines. Moreover, the Secretary of State as owner is required to approve the overall direction of the DRA's business through scrutiny of the Corporate and Business Plans and Agency's quarterly results—both financial and performance against key targets.

The role of Secretary of State as owner does not, however, provide for the involvement of the MoD in the day to day operation of the DRA wnich is entirely the responsibility of the Chief Executive who is Accounting Officer for the Trading Fund, with complete responsibility for DRA accounts and financial procedures, and for the proper and effective use of DRA resources. The Chief Executive's formal powers are set out in a letter of delegation from the MoD's Permanent Secretary; in addition to the financial powers already mentioned, these include authority for the full range of personal management functions for all staff at Grade 4 and below.

From the DRA's point of view, its position as part of the MoD, owned by the Secretary of State, means that in practical terms it does have to consult over some issues which—if it were an independent body—would be the concern only of its own management. For example, Ministers continue to need to be consulted over major rationalisation and/or redundancy plans and potentially controversial proposals.

1.2 *Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

The Trading Fund has led to higher specifications and closer monitoring of performance on the part of the customer with a more efficient delivery of an altogether better value product on the part of the DRA, as relationships have adjusted to the formality imposed by the new customer-supplier arrangements, becoming more akin to those existing with other large commercial organisations. By way of illustration, whereas the DRA was achieving only 52 per cent of milestone delivery on time in 1991–92, it is now achieving over 85 per cent with a declining amount of money available to spend on defence research. Such changes clearly work to the benefit of the MoD.

1.3 *How does the DRA's status affect its research strategy?*

It is for the MoD to set priorities and requirements for research to support the Government's defence policy and to pass those priorities and requirements on to the DRA when it places "contracts". In practice, because of the degree of expert technical and scientific knowledge that resides in the DRA and notwithstanding the formal customer-supplier relationship, the process of setting priorities etc is far more of an iterative business, with the DRA feeding in its advice and experience at every stage. Whilst the MoD as customer authorises *what* is researched, the DRA has control of *how* that work is done. The DRA is currently developing a technical strategy which seeks to define the principles and processes by which DRA scientific activity is initiated, explored, prioritised and developed.

1.4 *How has the MoD's system of Research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading Fund Status?*

Package management, which pre-dated the creation of the DRA, was introduced to allow the Operational Requirements staff in the MoD to categorise more clearly their applied research requirements and the DRA to respond more closely to them. It is, therefore, entirely consistent with the New Management Strategy in that it allocates clear responsibility for specifying a programme of work to an individual desk officer "customer". It has also fitted well with the subsequent move of the DRA to Trading Fund status which has put the money—as well as the responsibility for specifying the work required—into the hands of the customer. A further advantage of package management is that once the MoD customer has articulated his requirement in military terms, the onus is then on the package manager within the DRA to ensure that the DRA responds with the mix of technical work, whether from inside or outside the DRA (or more likely a combination of both), that offers best value for money for the customer. Package Management in the strict sense of the term applies only to the Applied Research Programme. Alternative tasking arrangements have been developed for the consultancy type project support work that the DRA conducts for the Procurement Executive.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

MoD

The DRA's relationship with MoD has already been covered to a large extent in the answer to question 1.1. It is, however, worth mentioning one further aspect of that relationship, namely that Treasury rules mean only MoD can be DRA's "banker", ie, the source of approved grants for the initial rationalisation programme or of long or short term loans to meet working capital needs or finance for its capital expenditure programme. Loans are subject to a formal repayment schedule and to interest at rates equivalent to the National Loans Fund. CE DRA accounts personally for funds from the MoD vote as an Additional Officer of the Department.

Other Government Departments

The DRA has traditionally received funds from OGDs, notably DTI and the Home Office, for research programmes and services geared to meeting civil needs. The creation of the Trading Fund has not affected the fundamental nature of this relationship, although in line with the establishment of a tauter customer-supplier relationship between DRA and MoD, a more formal framework has now been introduced for OGD customers. With regard to the civil research establishments, and organisations such as AEA Technology, the DRA is keen to establish collaborative arrangements where interests coincide and has recently mounted a major conference to improve understanding of what the DRA has to offer.

Industry

This is dealt with in greater detail in Section 3. Briefly, the DRA is now placing considerable emphasis on the need for collaboration and co-operation with industry in order to obtain the maximum benefit from the limited resources available for defence research. However, this will not preclude competition—which both the MoD and DRA view as essential in order to ensure that the defence customer is getting best value for money—and, in practice, such competition is likely to lead to new opportunities for industry, rather than the DRA pushing its way into traditional industrial markets.

1.6 *How is the process of formulating a strategy for the DRA being affected by the new thinking about defence and foreign policy following the end of the Cold War?*

The MoD's research requirements are kept under constant review to reflect the strategic environment. MoD, in close consultation with the DRA, identifies and monitors key defence technologies, for which indigenous capability is required, relying on military and scientific judgements. The capabilities required by

MoD may be provided either by industry or by the DRA or other establishments, such as CBDE. The DRA have the lead in developing a strategy for decreasing the cost of providing the research required by MoD and hence in assisting MoD to reconcile the conflicting pressures for more advanced technology with a reducing budget.

1.7 *The DRA, like its predesessor organisations, has as its primary role the provision of research services to the MoD. In the past, however, the defence research establishments have also provided other (non-research) scientific and technical services to the MoD (significantly so during the Falklands and Gulf conflicts), as well as to other Government departments and private customers. How far should the DRA continue to provide such services, and to whom?*

Support to the Armed Forces during a period of conflict can take one of two forms—the provision of expert advice on the modification and use of equipment, and the provision of actual pieces of kit machined and modified in the DRA's own workshops. It is the former which is by far the most important for the DRA to continue to provide and the intention is that such advice will continue to be available to the Armed Forces. Indeed, the DRA's Framework Document provides for such advice to take priority over any other work in the event of a military crisis.

With regard to the second element, the reduction of workshop capacity in the DRA and an increased dependency on outsourcing will undoubtedly reduce the DRA's ability to supply urgent operational needs. This need not however have an adverse effect on the Armed Forces since provided the expert knowledge remains in the DRA, as is intended, it should be possible to supplement that expertise with effort from industry. Indeed, many of the technological fixes employed in the Gulf War were a joint effort between DRA and Industry.

On the wider issue of non-MoD customers, the DRA is free to make use of its resources in support of other Government Departments and private sector customers provided that this does not compromise its ability to discharge its functions for MoD, and, in the case of private customers, that it absorbs surplus capacity. A particular issue here is the ability to exploit private sector work to help sustain research teams or facilities for defence purposes which might otherwise fall below critical mass. An expansion of non-MoD business is a key plank of the DRA's current business strategy, not because it wishes to diversify for its own sake, but in order to support the wide range of capabilities required to meet the needs of its defence customers.

2. The DRA's Management, Internal Affairs and Corporate Strategy.

2.1 *Will planned restructuring and rationalisation affect excellence, or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?*

The structure and organisation that the DRA inherited was top-heavy in terms of support services; for every single revenue earning scientist in the Business Sector there were one and a half support staff. In addition, there were 41 manned sites, each needing to be maintained, administered, guarded etc. These factors made for a crippling burden of overheads; further reductions in income would almost certainly have exacerbated the problem since the same fixed costs would remain. In these circumstances, the only way the DRA could hope to turn itself into a successful, efficient organisation was to introduce a radical rationalisation programme. This programme, which is intended to take £100 million per annum out of annual running costs by 1997–98, will not affect scientific capability (except for a few minor perturbations as moves take place), and will actually lead to the customer receiving better value for money; there is already evidence that costs are falling.

Concurrently with its rationalisation programme the DRA is also introducing its Total Quality Process which involves a radical change to the way it goes about its business, empowering responsible managers and staff to get on and achieve. The quality of the product is of paramount importance in this process; it is the DRA's aim to see that it is enhanced, not hindered by all the changes that are taking place.

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting-up of the agency?*

The rationalisation programme is absolutely essential if the MoD and other customers are to continue to receive the volume and quality of research that they require at a cost they can now afford. But in any case, the Chief Executive, John Chisholm, believes firmly that if change is to be introduced it must be done quickly, and experience would seem to bear this out since the DRA's costs are already falling, productivity has increased, and—as noted in para. 1.1—a higher percentage of customer milestones are being met on time than ever before. There have been casualties of this programme, not least the 1,500 staff shed by the DRA over the last two years. But without the rationalisation, the eventual impact on the DRA would have been far worse.

2.3 *What are the implications of the new regime's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best Staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?*

The DRA is currently in the throes of devising a new management reward scheme which will be based on the following principles:—

- performance management—the DRA must maximise the contributions of individual members of staff by creating a performance management system based upon objective setting and performance review
- flexibility—necessary to allocate resources to demand and to allow project orientated teams to flourish
- reward—staff must be rewarded on the individual worth to the DRA rather than their status
- teamwork and empowerment—recruitment, selection and reward process must emphasise teamwork and flexibility and managers should be able to use these processes to manage staff to meet their business needs.

The scheme when introduced will enable the DRA to offer potential recruits a pay and career structure based on achievement, which should prove attractive to precisely the sort of motivated individual which the DRA needs. Recruitment of scientists is currently buoyant, but this is undoubtedly due in some part to the depressed jobs market. The new scheme will avoid the bureaucratic disadvantages that would possibly have choked off supply once the job market revived.

The only "personnel" constraints on the DRA arise from the standards and guidelines set down by MoD and central departments and the fact that the Agency's staff are members of the Principal Civil Service Pension Scheme which entitle them to certain early retirement and severance benefits. Whilst before the establishment of DRA as an executive agency there was a reluctance to shed less effective members of staff, the stricter financial disciplines of the Trading Fund mean that Business Sectors will no longer be able to take this approach. Within these parameters, the DRA has the freedom to take whatever measures it believes are necessary to retain the staff it needs and shed those it does not want

2.4 *Pathfinder is the DRA's programme to allow private companies to gain access to research at a much earlier stage and to contribute ideas which align with their in-company, possibly civil, research programmes. The projected advantages of Pathfinder include more value for money by prevention of duplication of research and improving take-up of promising ideas, and providing companies with the earliest opportunity to develop their ideas thus improving their wealth-creating potential. Is the programme worthwhile? If so, does it need refining and how can it be improved?*

Pathfinder was only introduced in 1992, but in its first year DRA received 640 proposals. As was to be expected first time round, some of the proposals fell short of the required standard; forty (valued at £20 million in total) were of such quality that they were incorporated immediately into the MoD's research programme; and a further 133 (worth in the order of £43 million) are still being evaluated.

This year's Pathfinder was initiated at a conference in November 1993 attended by over 300 delegates from a wide cross-section of industry. It is too early to predict what the response will be but on the basis of last year, the DRA is hoping for a large number of very worthwile proposals. The DRA has already introduced some modifications to the way the Pathfinder process is managed to ensure that proposals are launched in specific areas of interest and that those involved in evaluation within the DRA are identified clearly at the start as the point of contact for information and briefing.

Obviously it is too early to make a sensible judgement on the initiative's value, although it is worth stressing that as a result of Pathfinder 92, industry is being included in programme preparation at a much earlier stage, which is beneficial to both them and the MoD.

The Committee should be aware that, in addition to the commitment in the Government's White Paper "Realising Our Potential—A Strategy for Science, Engineering and Technology" for the DRA to monitor progress in transferring its expertise and technology to industry and on the Agency's generation of income from sources outside Government in its Annual Report, the Pathfinder programme is likely to be the candidate for a policy evaluation exercise.

2.5 *How does the DRA identify future defence needs, and is its method of identifying such needs properly thought out?*

In so far as defence research exists primarily to support defence policy, then the overall shaping of the defence research programme and the ordering of priorities must be decided by the MoD, policies and priorities being relayed to the DRA through the customer-supplier relationship. Within the MoD, the Defence Research Committee, chaired by the Chief Scientific Adviser, is tasked specifically with taking a strategic overview of the research programme and considers annually a paper that looks at the shape and balance of defence research with a view to re-ordering priorities if necessary.

In order to be able to contribute effectively to the debate about future research needs, and to ensure that it is itself geared to respond to future needs, the DRA is currently undertaking a series of studies:—

- a review across all DRA Business Sectors, led by Operational Studies, to develop a five to 10 year forward generic statement of the military needs and possible technical opportunities.
- an examination of the implications of advanced manufacturing and concurrent engineering in the Defence Industry.
- a survey of current thinking and world best practice in research and technical strategy—including value analysis, core competency analysis and technology foresight.
- an analysis of DRA's current technical skills and technologies, including those that may be affected by potential reductions in the defence research programme.

These elements will be combined to produce a strategic overview of what the DRA believes should be the way ahead which will in turn allow it to assist MoD to determine overall policy for the next decade ahead.

3. THE DRA'S RELATIONSHIPS WITH INDUSTRY, EUROPE AND THE WIDER WORLD.

3.1 *Is enough being done to link the DRA's defence-orientated concerns with civilian projects, and should civilian spin-off be a major concern for defence research?*

The primary purpose of MoD-funded research is to meet defence objectives. It has always been recognised, however, that in some areas military and civil needs coincide and it makes sense therefore to run a joint civil/military programme. The best example of this is the Civil Aerospace Research and Development Programme funded by DTI which involves the DTI putting up funds for civil research which are spent either through or in the DRA on a programme of work that is funded also by the MoD for military purposes. The greater "mass" of funding that is achieved through this joint approach has proved particulary beneficial; achievements such as the Airbus wing design have derived directly from the joint programme.

On a wider front, the DRA is concerned to ensure that research carried out for military purposes is available for take-up by firms interested in its civil exploitation. Involving firms as early as possible in the research programme is thought to be the best way of assisting this process, which is one of the reasons the DRA has embarked upon the Pathfinder and Strategic Alignment initiatives. A third element that could prove useful in aiding civil spin-off is the DRA's plan to establish Dual Use Technology Centres, the first of which (Structual Materials) will be at Farnborough, in which DRA and outside scientists will be able to work side by side on technologies with both military and civil applications.

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

It is impossible to identify a standard set of conditions; requirements vary from case to case. Clearly there needs to be a willing recipient but that in itself may be difficult since the output of a research programme more often than not requires considerable and expensive investment in development before it can lead to a wealth creating product. Both the MoD and DRA believe that the earlier industry is involved in the research, the more likely they are to be able to give it a tweak in the right direction towards a developable product, hence the initiatives referred to above. It is also necessary, however, for the DRA to go out and advertise its achievements, and be ready and willing to enter into licensing arrangements. The DRA's Sectors are enjoined to seek out licensing opportunities; they are supported by an experienced Intellectual Property Department through whose efforts the DRA is likely to achieve an income of £12 million this year, with potential to rise to over £20 million in five years time.

3.3 *How does the DRA connect to the Technology Foresight exercise being conducted by the OST.*

The work the DRA is currently doing in formulating its own research strategy involves looking ahead at likely emerging and important technologies; this, together with "Pathfinder" and other initiatives, places DRA in an excellent position to contribute to the Foresight exercise. John Chisholm, the DRA's Chief Executive, is a member of the Foresight Steering Group, chaired by the Government's Chief Scientific Adviser; other DRA staff are participating in the panels that have been set up to look at technology areas.

3.4 *How effective are the DRA's links with the DTI, and is there too little DRA involvement in the DTI's LINK scheme?*

The DRA maintains a close working relationship with the DTI on those programmes of works which they fund—namely the Civil Aircraft Research and Technology Programme (CARAD), space-related research and development sponsored by BNSC, and some smaller programmes in Electronics and Information Engineering. The framework agreements mentioned in para 1.5 are intended to provide a more formal customer-supplier relationship, and are generally considered to be working well; regular meetings are held to monitor their operation and iron out any difficulties.

On a more general level, the DRA keeps in close touch with DTI on issues such as the encouragement of spin-off, contribution to wealth creation, etc., and indeed has enjoyed warm support for initiatives such as Pathfinder, Dual Use Technology Centres, etc.

The DRA is currently involved in six LINK projects, its contribution being worth about £1.3 million in this financial year, funded mainly by MoD Customers (60 per cent) and the remainder by DTI. The DRA views LINK projects as a highly effective means of creating the right conditions for technology transfer, since they involve collaborations at an early stage between industrial and science-based organisations. The conditions governing the LINK scheme are however constraining; in particular the requirement that the DRA's contributions should count as part of the 50 per cent HMG share, leaving out the balance to be found by industry, has undoubtedly put off potential collaborators.

3.5 *Has the DRA effectively filled the void left by the demise of Defence Technology Enterprises, and is the DRA any more likely to succeed where DTE failed?*

A number of factors contributed to the demise of DTE but amongst the most decisive were the lack of personal involvement by its staff in relation to the technologies DTE was trying to exploit, and the lack of investment available to fund the commercial development of what are essentially research ideas a long way from the production stage. The DRA believes that the scientists in its Business Sectors are the people who have the best chance of persuading industry to invest in their ideas which they are enjoined to pursue exploitation opportunities, calling on outside expertise to help them where necessary. So far their achievements have been on a fairly modest scale—there were about 80 licensing agreements signed in 1992–93 (of which 19 were notable in monetary terms), and so far in 1993–94, there have been 6 further agreements of significant value. By the end of the financial year, this could be as high as 16.

3.6 *What is the DRA's role in the issues of conversion and diversification in the defence industry as a whole?*

The DRA has no specific role in the conversion and diversification of the defence industry, although the initiatives already described, which are all intended to maximise the contribution of defence research to wealth creation, offer industry the opportunity to identify at an early stage civil possibilities in the technology that the DRA is pursuing for defence purposes.

3.7 *How should the DRA relate to the part of industry which is not concerned with defence and how much should it focus on dual-use research?*

This has been largely dealt with in the comments on the earlier questions in Section 3, although it is perhaps worth reiterating that whilst defence research funds are voted to meet to defence objectives, the DRA is positively encouraged by the terms of its Framework Document to "co-operate with industry in the United Kingdom to ensure that the DRA's output is exploited to the full, consistent with defence requirements". What this means in practice is that whilst the DRA would not embark on a programme of work unless it was required for defence purposes, it recognises and is now seeking to exploit the dual use potential of many of those technologies for the general good of British Industry. The DRA reckons that about 20 per cent of its existing work is in topics that have dual use potential—although the dual use component is usually a small fraction of the total technologies in any one particular area.

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

The DRA is required under the terms of its Framework Document not to enter into any contracts with outside firms that might prejudice the obligations to provide an independent scientific and technical service to the MoD. Only the Project Support element of the work which DRA carries out for MoD is currently subject to primary competition; this is being introduced progressively with the aim of 100 per cent by the end of 1995–96. The DRA is, however, required to compete at the secondary level an element of the Applied Research Programme, and also intends to let an increasing percentage of subcontracts through competition. In addition the DRA has an extensive programme of market testing of its support services area. Taken together, this will mean that a steadily rising proportion of the DRA's turnover will be subjected to competition over the next five years, and where such competition takes place, DRA is expected to compete on the same basis as industry. As far as practicable, identical terms and conditions will apply to all competitors.

The DRA has gone to great lengths to ensure that where it might be both bidding and evaluating responses, there will be a strict dividing line between the personnel involved. A Senior Manager has been appointed as "Ombudsman" to scrutinise the running of competitions and investigate complaints and, to oversee the whole process, a Market Testing Review Board (with a majority of non-DRA members) has been established.

Where DRA has access to commercially sensitive information, it is expected to take appropriate measures to safeguard it and ensure that the business sector bidding for MoD business in competition with industry is not privy to such information if this would prejudice the fairness of any competition. As the extent of competition with industry grows, MoD will review the DRA's access to such information. For example, MoD is currently in dialogue with the CBI on whether or not DRA should continue to receive MoD costing information and advice when pricing sub-contracted work placed on behalf of MoD.

All in all, the MoD is satisfied that the DRA has set up suitable mechanisms to cope with potential conflicts of interest, and the scope for unfair competition has been minimised, although this does not mean that either MoD or DRA is complacent and indeed the situation will continue to be monitored.

3.9 *What kind of relationship exists with the EC Framework programme and other European (including non-EC) programmes, such as EUCLID and EUREKA?*

DRA has extensive involvement in EC Framework programmes such as BRITE/EURAM, ESPRIT, SCIENCE AND MAST; in such, it can act as technical adviser to HM Government and/or as collaborator with other European firms and organisations. The DRA is involved in over 50 projects worth in excess of £35 million and the DRA's contribution is about £3.5 million this financial year, and with its partners has recently won contracts in the BRITE/EURAM programme against strong UK and European competition.

In non-EC programmes, the DRA is involved in EUCLID; so far the DRA has some 18 contracts for research technology projects and a further 14 are being prepared. The number of Common European Priority Areas has been increased recently and this potentially widens the scope of the EUCLID programme considerably. DRA staff act as agents of MoD in their membership of 10 out of the 13 CEPA Management Committees and this is fundamental to the UK's participation. Because of the way MoD funds EUCLID, when it comes to participation in programmes, the DRA can only participate as a sub-contractor to UK industry and cannot directly compete for funds. The value of work currently funded by IEPG countries for EUCLID programmes is about £14 million and the UK's contribution is worth about £4.2 million in this financial year.

The EUREKA scheme requires participants to contribute 50 per cent of the costs as own (or private venture) funding, and is essentially concerned with short-term projects which are nearly marketable. In the case of DRA, funds can only come from MoD or OGD customers, and as, under its Framework Document it is excluded from engaging in "development" work (which is what a EUREKA project would be), the DRA would probably be precluded from EUREKA programmes.

3.10 *Does the DRA seek European collaboration as a matter of course?*

Research collaboration is pursued by MoD as a means of achieving the aims of its research programmes in a more cost-effective manner and to share costs where there is a common requirement, eg, on Technology Demonstrator Programmes. MoD provides guidance to DRA on areas and countries where collaboration is acceptable, and indeed desirable, and on the relatively few topics on which it is not. DRA seeks collaborative opportunities as a matter of course within these guidelines.

3.11 *Is there in other countries anything relating to the management of defence research from which the United Kingdom could learn?*

The experiences of other countries were considered carefully when the DRA was being created and the research management procedures were being established. The best foreign practices were absorbed into the UK's procedures. Since then, our approach has attracted considerable interest overseas. We employ a process of continuous review and refinement, including the exchange of ideas and information with colleagues overseas, to ensure that every advantage is taken of new ideas and concepts.

Examination of witnesses

MR MICHAEL J V BELL CB, Deputy Under Secretary of State (Defence Procurement), DR GEOFFREY G POPE CB, Deputy Chief Scientific Adviser, and AIR MARSHAL SIR ROGER AUSTIN KCB AFC FRAeS, Deputy Chief of the Defence Staff (Systems), called in and examined.

Chairman

1. On behalf of the Committee, I would like to welcome Mr Bell and his colleagues. Would you like, first of all to introduce your team?

(*Mr Bell*) I am Michael Bell, Deputy Under Secretary of State for Defence Procurement in the MoD, the focal point for DRA matters. To my right is Dr Geoffrey Pope, the Deputy Chief Scientific Adviser, responsible for the strategic research programme. To my left is Air Marshal Sir Roger Austin, Deputy Chief of the Defence Staff (Systems), responsible for the applied research programme.

2. To get one thing straight at the outset, the latest framework document of the DRA dated April 1993 refers to a focal point within the Ministry of Defence for dealing with DRA. That is you?

(*Mr Bell*) Yes, it is.

3. Could you, therefore, just explain, as focal point, how you act?

[Chairman *contd.*]

(*Mr Bell*) I have two main functions. I advise Ministers on matters relating to the ownership function of the Defence Research Agency and I act as coordinator of business affecting the DRA across the board in the Ministry of Defence.

4. Are you, therefore, precisely reflecting the recommendations of Sir Angus Fraser in the document of 1991, "Making the most of Next Steps", where I think this was a recommendation?

(*Mr Bell*) I do regard myself as a Fraser figure in those terms, yes.

5. Do you conform to the pattern which is set out in that document?

(*Mr Bell*) I think so. There is no precise rule. The role of the Fraser figure does depend a lot on circumstances and on the relationship with the agency concerned. I think my role is perfectly consistent with Fraser, yes.

6. That is very helpful. Perhaps we could start by way of introduction, and this is a question which I think you have seen listed, by your telling us something about how you perceive the DRA's transition. Do you think that the service being rendered now to the Ministry of Defence has changed in any respect, either in terms of quality, performance or the like? Are you satisfied that the new remit and the new mode of operation is working to your satisfaction?

(*Mr Bell*) Could I turn that question to the principal customers, starting perhaps with Dr Pope?

(*Dr Pope*) Our experience is very much that the relationship now developing with the DRA, where we have trading with them, where money actually changes hands, is in fact having a very beneficial effect on the kind of service they are providing to us and it is also providing them with a strong incentive to make their operations more efficient. As you will be aware from the paper work that you have seen, a number of initiatives have been taken by them in that regard. This is particularly important clearly at a time when public funding is very short. In a sense, it may seem strange that as a customer for strategic research—the long term speculative work—I am actually talking in terms of a sharp customer-contractor relationship. What I would say is that with speculative work you need to get your research workers to identify the bright idea that they have. Speculative work necessarily starts from the scientist seeing something of potential value to defence, rather than us defining exactly what is required. Even then, when they have defined what they think they should be looking at and how to go about it, one does want a proper customer-contractor kind of structure, so that one can see which of these ideas is really going to lead on to something which will be carried through into defence exploitation and which will wither on the vine. If one is talking about the long term speculative element of the work, there will necessarily be some of the latter. So far as the success of the arrangement generally is concerned, I would like to say that in the early days there was one source of concern which was expressed to me by industry and which I am sure you may well pick up in other evidence, that in going to a more competitive environment, there was at first some worry on the part of industry about their relationship with the Defence Research Agency. This is not just an issue related obviously to technology transfer, but also to the kind of joint programmes which had been so beneficial in many defence fields—going back into my own experience, for instance, bringing together lots of different pieces of technology into a total system which is the kind of thing which at the technology demonstration phase has always been very much a partnership between research establishments and industry. I believe myself that there is nothing intrinsic in the new arrangement which prejudices that kind of work in any way but there was a trough when the DRA was first started because of worries about the competitive issue. In fact, I think that competition has now been defined in a manner which does satisfy industry. I believe myself that although we have not fully recovered the ground, we will do so in due course. The issue is not something intrinsic; it was just a transitory phase.

(*Sir Roger Austin*) With the applied programme, which is the newer term programme, it is the MoD customers who decide what that programme is to be and they pay for it. I think the research is now more accurately targeted into projects that we have in the nearer years through more detailed specification and the performance of the DRA is more closely monitored. That has brought about a fairly considerable culture change in the DRA, resulting in a very much more responsive organisation. As far as we can tell, the quality of the research is at least as good as it was before. It certainly has not deteriorated. My subjective judgment is that it is probably a little better; certainly value for money is better. The only area of minor dissatisfaction we have is a concern about the interface between us and the DRA. The administrative and financial arrangements need a little refining. That work is in hand and not a long term worry at all.

7. May I pursue that latter point? You rightly point out it is for the Ministry of Defence to determine what it requires of its contractor. Is there in any sense a role for the DRA itself to make a contribution to helping the MoD to determine what its priorities might be? Is there technology push as well as customer demand?

(*Sir Roger Austin*) Yes, there is, because when creating the programme we clearly discuss it with the DRA beforehand as to what the general aim is and the best way of going about it. The programme we task them with is the result of some negotiation and discussion between us. There is ample room for DRA to put their views.

8. Does this happen?

(*Sir Roger Austin*) Yes, it does.

Baroness Hilton of Eggardon

9. Clearly things have changed enormously in the world at large in the last three years in strategic terms. What you have been talking about really is projects at the ground level, practical projects. You are suggesting, I think, Dr Pope, that the scientists often have bright ideas of their own and you let them pursue them. There was some suggestion that you were letting the customers, presumably the various

[Baroness Hilton of Eggardon *contd.*]

wings of the military establishment, determine what you wanted. Is there an overall Ministry of Defence strategic vision of where the DRA should be researching and what they should be doing in the future, in the light of the end of the "Cold War" and the breakdown into probably much smaller conflicts in the future?

(*Sir Roger Austin*) The research is aimed at supporting the equipment projects we envisage for the future, which cover a pretty broad area, of course, and thus the research programme we come up with covers an equally broad area. Having created that, purely from the viewpoint of the projects we have in mind, we then look at it from the side, if you like, at the technology balance of the total package we have created to make sure there is not imbalance and that there are not areas of technology which are being neglected for the next five to ten years perhaps or, if there are, to make sure we are conscious of them. That is, a conscious decision and not one made by default.

10. Have you actually changed your strategic view of what is needed as a result of the cessation of the two power blocks crumbling?

(*Sir Roger Austin*) I do not think there has been a major change, no, because although the nature of the conflict that we might face in the next twenty to thirty years has changed a little, we have to be conscious of the equipment we will be against and what equipment we need to counter it, and there is not a lot of change there.

(*Dr Pope*) We have, within the Ministry of Defence, a Defence Research Committee which is chaired by the Chief Scientific Adviser, which takes once a year an overview programme on the research paper as a whole, to which Sir Roger Austin and I both contribute; the intent of this document is to cascade down from defence policy and concept through into what this means in equipment and research terms. I entirely agree with what Sir Roger has said. In reality the balance of the programme that is required has not changed in a gross way as a result of changed circumstances because effectively the kind of equipment which was developed in the former Soviet Union is still likely to be facing us in various parts of the world. There have been some slight changes of emphasis; for instance, in looking at the balance of technologies, one is thinking rather more in the direction of increased mobility where the ability to deploy widely in different parts of the world is a somewhat different context as against devoting attention to central Europe.

Lord Renwick

11. I have a question in about three parts. Really it is going back to your relationship with DRA and the evolution of DRA as it is now. The first part of my question is that there are certain technologies which are being developed by DRA: is it MoD's responsibility or task or the DRA's task to decide which of the technologies should be retained within the United Kingdom? This is something which I think is interesting to us and will explain rather accurately your relationship and continued relationship with DRA. Also, DRA is changing, as is the MoD. It does seem that perhaps the DRA will become more of an animal in itself with more of its own outside connections, outside the MoD, and the MoD perhaps will be in a position of losing its apparent first position of having first call on DRA's research services. This brings me to the second part of the question of which you have had warning: does the MoD think that in terms of research or advisory capabilities it might seek in the future these from elsewhere in the United Kingdom or from other sources, from Europe or elsewhere?

(*Mr Bell*) May I start by saying that the framework document, which of course you have seen, does make it absolutely clear that the DRA's first priority is to carry out tasks for the Ministry of Defence. That remains true. We may move on to discuss the balance between DRA's work for defence and work outside defence for non-defence customers, but the starting point is that the MoD is the DRA's primary customer and that in practice remains absolutely the case. On the question of retention of technologies, I will turn to Dr Pope, if I may, though my initial answer would be that it is genuinely an iterative process. There may be technologies which are attractive but unaffordable. There may be technologies where we are world leaders and have high quality research but where the activities are attracting a lower priority than perhaps they used to do. This kind of balance is one that we have to make in the process that Dr Pope has already described. Perhaps I could ask Dr Pope if he has anything to add?

(*Dr Pope*) When it comes to the issue of what the Ministry of Defence requires to have available to it indigenously within the United Kingdom, it is fundamentally a decision for the Ministry of Defence to take. However, a lot of specialist competence is now within the Defence Research Agency; so, as Mr Bell says, it is very much an iterative process between the Ministry of Defence and the DRA. I have on my staff a very small technology audit team which does study this kind of issue in relation to specific areas at different times. There what they are doing is saying, "What is the need of MoD in this area? How is it best fulfilled?" Sometimes it may best be fulfilled by buying technology from overseas, or it may be that the civil technology is developing at a rate where we do not need to make a particularly large contribution and where all we may need to do is a relatively small amount of work to meet defence needs. The information technology area is one where there is a great deal going on in the civil world which can have application also in defence. Then, of course, some work we take on board within our own programmes. If we are anxious to maintain an independent source of technical competence which can be used in assessing competitive bids from various firms, obviously one must have that in the public sector. So far as MoD is concerned, the DRA is the normal repository for that kind of expertise. We cannot actually reach these decisions, obviously, without a strong inter-relationship with the DRA, in view of their specialised knowledge and understanding. May I also comment on expertise from elsewhere? So far as the United Kingdom is concerned, there are many instances where we do make use of expertise from outside the DRA, at universities and industry and so on, but particularly where industry is concerned, of

[Lord Renwick *contd.*]

course, there is the constraint that the firms which are giving advice may often be potential bidders in competitive procurement situations. Therefore, they cannot provide the same kind of independence. With regard to overseas, we do have research collaboration with various European nations, the United States and Commonwealth nations. Here, although we have some useful programmes which are developing and we are trying to take them further, one has some difficulty in depending on them to the extent of inter-dependence because different nations do have different priorities and sometimes if you go into a joint venture with another nation in pursuing a particular kind of technology, if that other nation has a financial crisis, it may wish to withdraw or, if our funding situtation is very difficult, we may wish to withdraw. You do lose a flexibility there and you do have to depend on how other nations may react to a change in world circumstances. For this reason, we do think very carefully before making ourselves at all dependent on overseas, bearing in mind the implications if we or they were to withdraw.

Lord Craig of Radley

12. I think it is common ground, is it not, that a significant portion of the work of DRA is to provide technical advice to the operational requirement staff? I am interested in that case in the extent that we continue to use or use increasingly the Cardinal Point specifications in order to allow greater access by contractors and what effect that may have on the DRA itself.

(*Sir Roger Austin*) The procurement executive will use a Cardinal Point Specification primarily when there is a system or technology in industry which will come close to meeting a requirement but they may use them at other times when they want to give industry a little more freedom. However, whatever the procurement route, and that is one of them, the creation of the operational requirement which precedes it is unchanged, and so the advice we need from the DRA in writing, the requirement in the first place, is unaffected by the PE's procurement route; in practice the timescale in which we are doing that research will be somewhere in advance of the Procurement Executive decision on which procurement route to follow. If anything, it increases our need for DRA's advice once industry has bid, following a Cardinal Point Specification, because there would be more variation in the bids that are made from different parts of industry, so there is probably a greater load. We would then want the DRA to help us to analyse those things.

13. Could I follow that up? There are some areas of industry which complain that the only way that they can deal with the Ministry of Defence on these sorts of things is through the DRA itself. Is that a fair criticism?

(*Sir Roger Austin*) No, I would not have thought that it was. Industry has a completely free access to all my staff, all the Chief Scientific Adviser's staff and virtually anyone in the Ministry of Defence, and they frequently use it.

(*Mr Bell*) Absolutely. Industry, if they have complaints to make on these matters, will make them at any level in our three organisations, and others as well. You put your finger on a problem about the Cardinal Point Specification system, which is that it is generally harder to evaluate the tenders because there is greater variety between them. Some tenders have strengths in some areas and some in others. The evaluation of the best buy in those circumstances is a tricky business. Not unnaturally, the losers tend to believe that their strengths may not have been given appropriate weight. It is quite difficult to do. Nonetheless, if industry has complaints, it can make them to us and we listen.

Lord Dainton

14. Now that the DRA is, as it were, free of the apron strings of the Ministry and washing its own face financially, there is bound to be a desire to maximise its income from other sources, which is now only 10 per cent from non-MoD or something of that kind. Do you see in this any kind of danger that it might be tempted to go into those areas which would make it a competitor rather than at the service end of contracts with industry, and might that have a bad effect on its relationship with industry and prevent it achieving the spin-off into industry which we want to see happen? Have I made myself clear?

(*Mr Bell*) Indeed, you have. We, of course, are the customer, so our view of this would be from the customer end. As I mentioned earlier, the framework document makes it absolutely clear that the Defence Research Agency's primary role is in support of the Ministry of Defence; secondly, in support of other government departments; thirdly, any other business they may pick up. In fact, what the framework document says is that the DRA may provide technical and scientific services to meet the requirements of other public or private sector customers when this supports the achievement of the first two objectives—that is Ministry of Defence first, then other government departments—and is using capabilities required for defence and other government department purposes that are not fully utilised. That is the framework which exists. As you say, the income from other customers is relatively small. It currently runs at about £50 million, of which rather less than half is other government departments and rather more than half non-Exchequer customers. The DRA envisage doubling that amount over the next four or five years. That would only constitute some 15 per cent of the total DRA business. We do not regard that as a serious risk to the priority of our programmes. Indeed, our concern is rather more about whether that increase can be achieved than whether it is too high.

15. There is no sense in which the DRA regards itself like, for example, AEA Technology, as in the market for general contractual research because it has a general research capability within the engineering area and a physical science base material in particular?

(*Mr Bell*) The DRA does want to maximise its income and the MoD as customer welcomes that for several reasons, not least that the more non-defence business that the DRA does, the more the costs of some of these very expensive facilities which we are finding increasing difficulty in utilising as our programme decreases, will be amortized over other

[Lord Dainton *contd.*]

customers. We do not see this, nor do the DRA, as a risk in terms of the relationship with industry. It has to be seen in the context of a drive by the DRA to improve the partnership with industry through, for example, the Pathfinder programme, the programme of strategic alignments and so on. In that context, competition, we would hope and expect, would not be regarded by industry as a serious threat to them. Indeed, we do not really expect that DRA will be taking business away from non-defence people. I include universities as well as contractors. In any event, as we know, industry themselves sometimes compete and sometimes cooperate. They put together consortia for some bids and they compete with each other for others. In the context, as I say, where the DRA has attached a priority, and taken action to improve, that cooperation with industry through the programmes I have described, we believe that industry will understand very much the context of the various competitions that are held. I should be interested to see the evidence to this Committee from industry on this but as far as I know we have not heard complaints, at least not recently, on that score.

16. This is not any part of the reason why the DRA is re-evaluating that kind of programme?

(*Mr Bell*) No. The Pathfinder programme is in its second year. None of us really expected to hole out in one. It is one of those exercises which is subject, as they say, to continual review and improvement. Even in its short life, I think one can say that it has been pretty successful, certainly as regards the objective of involving industry in DRA's plans and trying to ensure that research relevant to us but with a civil application was pursued in, as it were, the same context. I do not know if Dr Pope would like to add anything to the question of the success or otherwise of the Pathfinder programme?

(*Dr Pope*) This is, after all, only the first year. In the first year, one of the difficulties, of course, is in teaching industry just what the DRA is expecting from them. If you just say, "Put in propositions for collaborative research", you will get a rather wide spread until people have a real understanding. I understand in the first cycle there were 640 bids in the Pathfinder programme to a value of £175 million. I believe that 40 of these bids have, in fact, led to work going into the programme with a value of the order of £20 million. I think for a first time, with a reformalisation of this kind of relationship with industry, that is not at all bad. Obviously, there is room for a lot more development, so that industry does not waste time putting in bids on things which are clearly non-runners. I would have said it has got off to a good start.

17. I do not want to put words into your mouth. I am getting the feeling that this is the normal evolutionary initial phase in which the DRA being rather watchful and it is certainly not experiencing, as I understand it from what you say, any great pressure at present to augment its resources by going over the edge of the balance which would make it inimical to it.

(*Dr Pope*) That is true.

(*Mr Bell*) The DRA believes, and we share the view, that the best interests of the MoD as a customer are served by a close relationship, a partnership/collaboration type of relationship, between industry and the DRA rather than in tooth and claw competition.

Chairman

18. Of course, it is important, is it not, for the purposes of credibility and confidence, that when DRA exercises its function first of advising on contracts which might be required by the MOD, and secondly goes into the mode of a partner in industry with one of our leading companies, for example, for the rest of industry that there is seen to be Chinese walls or arm's length between these different functions. I have to report that when we were at Alverstoke we were told the story about there having been a link with Plessey on developing MESAR and, of course, this was a contender for the radar for United Kingdom/French/Italian common new generation frigate. The Italians, of course, no doubt playing power politics on this, say this clearly disqualifies the DRA, because they are partners in this particular project, from giving impartial advice. That clearly is simply a tactic in order to favour their own. How would you answer this attack on the credibility of DRA when they are riding two horses effectively?

(*Mr Bell*) I think it is a problem that we face throughout industry. Industry may find themselves making bids for other work or engaged by us to evaluate bids by others. The DRA in that sense is not radically different from others, but it is certainly true that we would not wish to see the DRA position itself in terms of competition in a way which led to serious problems in this area. You refer, of course, to the MESAR radar. Certainly, in the many, many evaluations that have subsequently been held of the two rival radars for the Common New Generation Frigate, the DRA's advice, as far as I am concerned, has been wholly objective. We do need both to be objective and to be seen to be objective. I believe that is being done.

19. I am sure it is. It is not so much proving post hoc; it is more the perceptions at the time. One can imagine a situation within industry where, if there is a strong partnership between DRA and one specific company, the other company might say, "They would say this, would they not?" There is an inside track. The assessor is in an invidious situation. Is this a problem of perception?

(*Dr Pope*) Might I comment that this is not a new problem. The old establishments as previously constituted had just this kind of difficulty. For instance, if it comes to evaluating a combat aircraft where one of the bids is involved with a United Kingdom firm with the RAE, as it then was, or DRA today, involved with the technology to a large extent, with strong links in it, then one has got somehow or other to demonstrate to, shall we say, an American competitor that we are not just simply using it as a stalking horse and that it is a genuine competition. One has to structure an organisation in such a manner that the Chinese walls have credibility. I believe myself that DRA has been pretty effective in this but I am sure from time to time we will inevitably get cries of the kind you mention when there are, shall we say, disadvantaged parties in procurement.

[Chairman *contd.*]

(*Mr Bell*) You refer, of course, to the problem of the MESAR radar. I have not myself had—I do not know if my colleagues have—any complaints from our own United Kingdom industries so far about the way the system has worked. Of course, I ought to add that it is perfectly within our competence to choose another consultant or company to evaluate bids involving the DRA if that should prove to be appropriate. As Dr Pope has said, it is not a new problem. We do need to be seen to be objective. We do our best to do so. At the moment, so far as the United Kingdom is concerned, I think we have been reasonably successful.

Chairman] I am sure we are consoled to hear that this is not a new problem. Clearly, it is not a problem that will go away either.

Lord Trefgarne

20. The involvement of outside third parties to assess bids to the Ministry of Defence is, I think, a fairly rare thing. Are there any significant programmes recently which have been adjudicated on that basis and what has been the result?

(*Sir Roger Austin*) I can offer one, not recent, and I hesitate to mention the Nimrod AEW where the advice we had from the DRA, which was not then called the DRA but was the same establishment, was very good but we wanted to be absolutely sure and to be seen to be sure and we brought in another consultant to do a totally independent study of the radar. They confirmed the opinions of what was then RSRE.

21. It has not always been a very happy experience. In the DROPS case, for example, we had an outside consultant and had the most frightful trouble.

(*Sir Roger Austin*) It is not always easy, of course, to find an outside consultant who is totally impartial, who is seen to be impartial and who is competent. Sometimes we cannot find anyone. If we are not absolutely sure, we will not do it but, yes, we have brought a few in.

Lord Dainton

22. It is very difficult when he is in the marketplace too.

(*Sir Roger Austin*) Yes.

Lord Redesdale

23. This really carries on from the last question. You mentioned that non-MoD work at the moment takes third place and also that you envisage only a take-up of about 15 per cent of the DRA's capacity. If, in the future, there was a growing demand, would the MoD actually restrict the amount of work that can be carried out for non-MoD purposes?

(*Mr Bell*) The framework document sets out government policy on this matter, which is that DRA is not allowed to build or plan facilities solely for non-defence work. The work they do of a non-defence nature has to be done within the context of the facilities and so on that they have. This provides, if you like, a kind of natural limit to the amount that can be achieved. At the same time, for reasons I have already explained, we welcome DRA's involvement in non-defence work because the income directly reduces our bills and indirectly reduces the cost to us of under-used facilities. Certainly, we welcome the plans to increase non-defence work but, as I have said, in fact our concern is more about whether that can be achieved, given the state of the economy and so on, than because it is too high. Certainly, I think it is a very distant prospect that DRA's non-defence work would increase to a level where defence priorities might be seen to be at risk.

24. You mentioned that funds could not be built up within DRA. Is that not restrictive, say, to a scientist working on a project who has an idea about a non-MoD use, perhaps for an environmental anti-fouling paint? Would the fact that there are not funds within the DRA stop him developing it within the DRA itself?

(*Mr Bell*) I suppose I would have say that would depend. The DRA is interested in the wealth-creation side of the business, the passage of developments which were originally based on defence requirements into the private sector. The proposals to establish dual use technology centres, for example, are a case in point, where it may seem that there is a civil application. Then the DRA will try quite hard to make sure that that is taken up.

(*Dr Pope*) Surely the point really is that DRA is responding to the needs of its customers. If there is a bright idea within the DRA which is not of a defence nature and this is good enough for it to be sellable to a non-defence customer, then obviously one just enters into a contractual relationship with him but for all work there does actually have to be a customer.

Lord Trefgarne

25. If I can just pursue a parallel line to that, the snag is, is it not, that they cannot invest in equipment specifically to carry out that project, however attractive it may be to outside industry and however willing industry may be to pay.

(*Dr Pope*) If they wish to invest in equipment for non-defence purposes, they can seek the agreement of the Secretary of State in the specific instance. I forget the precise words but there is a clause within the framework document saying they may not do so without the express agreement of the Secretary of State.

(*Mr Bell*) In those circumstances, and I cannot speak for the Chief Executive, he might well seek to set up some kind of joint venture arrangement with the company by which the company would make the necessary investment in facilities, while the DRA provided the know-how. That would be a perfectly acceptable arrangement.

26. You do not see this as a problem or a bar?

(*Mr Bell*) No. What the framework document is designed to rule out is substantial investment in facilities which have no defence use.

27. Clearly the DRA is considerably constrained in the way it can approach these outside projects. If they are not going to see the approval of the Secretary of State, which is perhaps a sledge hammer approach, or might be in some cases, a ruse has to be developed to deal with it.

[Lord Trefgarne *contd.*]

(*Mr Bell*) I really do not see it like that. You are, I believe, taking evidence from the Chief Executive. It would be interesting to hear what he says. My own view is that he does not feel himself constrained. The main constraint is that he must have a customer, as Dr Pope has said. Regrettable though it may be, if he is unable to convince a company that some invention has a worthwhile civil application, then he is stymied, but that is perfectly reasonable. In terms of the availability of people or resources, I myself do not think this is a serious constraint on him.

28. Could I finally ask a related point about the setting of prices for the work which outside customers may require? How does the DRA approach that and is there sufficient flexibility to enable them to compete effectively with other research establishments where that is appropriate?

(*Mr Bell*) They are obliged to charge full costs for their work. It is one of the Chief Executive's main aims to reduce the cost base of the DRA to a point where DRA prices are fully competitive and that is what he is doing.

Chairman

29. Supposing the DRA found a customer overseas, would that be something you would have to vet? Presumably you would have to do so in defence terms.

(*Mr Bell*) On the defence side, certainly.

30. There would be no objection if there is no defence complication?

(*Mr Bell*) Of course, one recalls the liquid crystal displays which are one of the DRA's and its predecessors' most valuable developments. Unfortunately, largely that has been exploited overseas.

31. The Japanese exploited that. Suppose the Japanese came back to Malvern and said, "We are prepared to invest heavily in your research in this area", would that be something you would look favourably on or would you see complications?

(*Mr Bell*) We could not answer a hypothetical question. We would have to look at it.

(*Dr Pope*) May I make a point about what is going on at the moment? The DRA does make its wind tunnels, for instance, available to overseas industry and they have over the years been significant users. That is a simple commercial deal where overseas industry comes in and uses the facilities.

32. Wind tunnels is another rather interesting example. They are clearly a facility that is needed by the British aerospace industry and the like. Where the DRA in its rationalisation might have to close down that site, there would be a facility which is clearly needed by the country as a whole but it would be lost. That, therefore, suggests there is a charge at the moment on the MoD to maintain these facilities. Is there an adequate funding system in order to ensure we do not lose national facilities which clearly are in your keeping at the moment but may not be totally needed, or needed at all, for defence purposes but which should not be lost to the nation?

(*Mr Bell*) The funding system provides that we pay for what we require. Of course there are situations where we may have to pay a rather high price for a facility we know is going to be needed in the future but is under-used at the moment. The framework document does provide that in extremis the Secretary of State may direct that facility which is not commercially justified must be retained. The framework document also adds that the DRA shall not be financially disadvantaged by this process. Again, we would have to discuss it. The issues that would enter into the debate would be the extent to which the facility might be required by the civil sector at some future time, in which case we might look to other government departments to help fund them; the availability of facilities overseas; our enthusiasm for testing things in facilities overseas run by people who might learn rather more than we wanted them to about what we were testing, and so on. All these issues would have to be brought into account.

Baroness Platt of Writtle

33. If it were a facility that could be used by the civil sector, presumably you would take into account that they would pay for it?

(*Mr Bell*) Yes, indeed, but then the question I was being asked was about their not needing it now but needing it in the future. We are as altruistic as the next man but paying for a facility that somebody else will want to use at some time in the future is not a thing we would view with much enthusiasm. The point about the trading fund arrangement is that the costs are transparent. We actually know that we are paying for these things and we have to decide whether it is worth it or not.

Lord Trefgarne

34. Has the Secretary of State given any such directions or are there any in prospect?

(*Mr Bell*) No.

Baroness Hilton of Eggardon

35. Going back to the hypothetical question about new developments, we were shown a system using computers in parallel which allowed for accurate mapping by overflying aircraft which had most considerable commercial potential for producing accurate maps world-wide in all sorts of circumstances. That is something which is currently not developed which could be sold commercially and which might develop into something as exciting as liquid crystal displays. What is your view about that?

(*Mr Bell*) That is fine. If there is a classified element, of course, then there may be problems. Let us assume that there is not. Defence benefits from this, because in the end the technology may well come to be used for defence applications but it will cost a lot less if it has by that time a civil application.

36. The problem about the developments is that it starts to distort the strategic pattern of what has been done. Commercially exploitable findings can, in fact, divert research scientists from doing something new and exciting and will bring in money.

(*Mr Bell*) Not if we do not pay the bill; we pay. On the trading fund, the DRA has to have a customer, as

[Baroness Hilton of Eggardon *contd.*]

Dr Pope has said, for its work. If there is no customer, the work cannot be done.

37. My experience of research establishments is that things develop a momentum of their own, although in the first place there may not be a customer. There may be a dynamic new finding which takes off by itself.

(*Mr Bell*) That is absolutely true. Of course, the tricky thing about research is to provide the appropriate balance between, if you like, the customer pull and the technology push. One of the reasons why we felt it was a good idea to introduce a trading fund was to keep the technology push under control. Of course, you are absolutely right: scientists want to engage in clever science but the discipline of the trading fund is that they can only engage in clever science if there is a customer.

Lord Redesdale

38. You say "if there is a customer" but to what extent does the DRA actually go out and try and find customers? Is there a mechanism within the DRA that it can actually market itself?

(*Mr Bell*) Oh, yes.

39. Considering that some ideas may not be fully developed—you are talking about technologies that seems to have reached their zenith—is there a way in which technologies you are going into are marketed?

(*Dr Pope*) The business sectors of the DRA do have targets for going out and looking for non-MoD work. I am sure the Chief Executive will in due course elaborate on that more. There is a strong incentive for them to be seeking other customers. Of course, they have very well developed links with the obvious industries. The real difficulty with civil exploitation is often in, say, the aerospace field, when a technical development arises which has got some application somewhere quite different, say, in the shoe industry. That is when you have a real difficulty because the technologist at the research establishment may have a good understanding about shoes and what kinds of materials might be good; he would have no feeling at all for what is a marketable price for the shoe, nor would he have any idea at all of the market. One of the most difficult aspects of technology transfer out of defence, or indeed any other, shall we say, user-orientated research activity, is to see how to get across these boundaries, particularly when generally to get from a piece of technology to something which could be used in civil industry does require a further investment by someone. Obviously it would not be appropriate for that further investment to come out of the Defence budget.

(*Mr Bell*) So far, however, as what you might call the usual suspects are concerned, the high tech industries, the DRA's normal partners, the processes of strategic alignment, the Pathfinder programme and the establishment of dual use technology centres, are all designed to ensure that there is a free flow of ideas and thinking and research between defence and civil applications. As I keep saying, we welcome that because the more that we as defence customers can rely on research with civil applications, the cheaper it will be.

Lord Dainton

40. Going back to the other side of the coin, where the DRA has competence to answer questions in the future which might be put to it by the Ministry of Defence and also putting itself in a position to earn money in future, you referred earlier to full cost charging. We understand that. Does that full cost include what might be called a research charge to maintain that competence or do you feel it cannot do that and therefore to that extent are you limiting its capacity in the future?

(*Mr Bell*) The charging basis perhaps I ought to leave to the Chief Executive to explain in detail. The basis of charging includes an appropriate share of the cost of overheads, facilities and so on. One of the DRA's problems in doing business is that it is a high cost operation. One of the Chief Executive's aims, as I have said, is to reduce DRA's costs to a level which is fully competitive with the private sector. Indeed, he plans amongst other things, to remove very nearly £100 million a year of costs from his business through rationalisation. He regards that as absolutely essential to get his charging rates down to a competitive level.

41. That causes just a little anxiety. One thing, for example, is high temperature materials. I am now going back a very long time. It is quite costly but it is still important research which at the time did not seem to have an immediate application. How do you protect the future?

(*Mr Bell*) That is for Dr Pope to say.

(*Dr Pope*) I think that the basis of the retention of the DRA's technology expertise is the funded research programme. It is very important in a structure like that to have some means whereby one can fund longer term, more speculative work. For that purpose, I am, within the Ministry of Defence, the customer for the strategic research programme. I am assisted in that task by our Strategic Research Committee which consists of outside scientists and MoD scientists. We give advice to the DRA each year on broadly those fields, in the broadest terms, where we think there is real scope for innovative ideas which would be of major benefit to MoD. We also say, "If you have any bright ideas in a quite different field which you believe would be very important to us, then do not let us inhibit you from putting that forward as well". We review each year all the propositions coming forward from the DRA in that context. We obviously cannot fund them all. At present the element of the DRA total programme which is funded in this way is of the order of 8 per cent.

Chairman

42. In that case, there has to be a defence application.

(*Dr Pope*) Broadly, but it may not be a specific defence application.

43. One can envisage a situation where, to go back to non-defence applications, there is no actual customer but if the thing is brought a bit closer to the market by a bit more of an attempt to develop the matter and so forth, then there might be a customer.

[Chairman *contd.*]

Can they proceed in those circumstances or is the funding cut off?

(*Dr Pope*) They would have to seek some external source of funding.

(*Mr Bell*) If they cannot find a customer, they cannot proceed.

44. They cannot do any speculative work, thinking that if they get it a bit further there will be a customer?

(*Mr Bell*) There does have to be a customer to fund the work.

45. Would not the Rothschild concept of a surcharge sum to spend as they wish have some validity?

(*Mr Bell*) In a sense we meet that point through the Strategic Research Programme. We return to the point that the primary purpose of the DRA is to support defence. The Strategic Research Programme is designed, if you like, to provide this strategic funding to support that purpose. The DRA has, of course, been responsible for research and inventions which have had very valuable civil applications, of which liquid crystal display is an example, but only one.

(*Dr Pope*) Obviously in due course you will wish to return to this with the Chief Executive but I have had considerable discussions with him over the years about the whole issue of a Rothschild surcharge. The view he has adopted with me is very much that the purpose primarily of the DRA is to support the needs of the Ministry of Defence. In those circumstances, he is very happy that the speculative element of his programme should be through the strategic research mechanism we have got.

46. I have no doubt we will ask him about that. While we must accept, and indeed quite happily accept, the primary purpose of the DRA must be to support the MoD in the procurement and research which helps the procurement, it nevertheless has a subsidiary role which is clear in your framework document which is, where appropriate and where it is not in conflict with a primary aim, to work in partnership with industry as appropriate. In order to do that, it does suggest that you have to have a certain degree of commercial latitude which it is not the responsibility of the Ministry of Defence to fund. Given you are not only the owner but the prime customer, it follows that you do have a certain interest. The only way which comes to mind that you could reasonably expect a resource which would allow the technology push to be developed at the pre-customer stage would be to have a sort of surcharge concept. It is not an unusual one. Most commercial laboratories implement it in one form or another. It is a concept that a good research manager does allow a small sum of money to his productive scientist in order to allow him to do his own thing. It is a question of management. There is a concept which perhaps, as you say, we ought to be asking the Chief Executive about. As I understand it, it is not one you favour because you would simply be paying more for your contracted work.

(*Sir Roger Austin*) Would we not also be using defence funds for non-defence purposes with a surcharge?

47. I think if you take a very rigid view as to what defence purposes are, you might argue that but in practice, once you have charged the DRA or widened its base, then you should, surely, not be too pedantic in your mechanisms?

(*Mr Bell*) We are not. That is the reply. If we think that some piece of work does have a potential defence application, and we can find room for it in our programme, then we fund it. We are addressing, as I understood it, a case where the research appeared not in our view to have a defence application.

48. We are not quite talking about the same subject. I am more suggesting that under the Rothschild surcharge concept, the research establishment, be it the DRA or whoever, should be allowed to make a turn on its contract and use that money for its own purposes.

(*Mr Bell*) I understand the point you are making. As Dr Pope has said, that objective is met in our case by the Strategic Research Programme in the hands of the customer, specifically Dr Pope. Of course, that limits the scope of research to things which the MoD as a customer wishes to be pursued and is limiting to some extent. Given the terms of the framework document, we think that not unreasonable.

Lord Dainton

49. Turning the thing the other way round, the DRA are getting what really is a hidden subsidy by a perfectly legitimate route for its basic research. It is then in an advantageous position *vis-à-vis* an industrial competitor who has to pay for his basic research himself. This brings us back to the original question about competition with industry, but the DRA has not come across this, you said, as a problem.

(*Mr Bell*) No. Of course, we can make available the results of our research to our contractors or to the people who are providing us with equipment. The intellectual property rights which we have over research carried out wherever provides the MoD with free user rights, which means that if a contractor needs to use it for our purposes, then we give it to him.

(*Dr Pope*) So far as this issue of playing on a level playing field for industry is concerned, there are all sorts of other issues like the return on capital which have a larger effect than this particular issue.

50. Since the DRA has put them in its budget as money coming from the Department, the Ministry of Defence, it meets this requirement for the Ministry of Defence to look after basic research capability of the research agency. Could you give us an idea of the magnitude of that in relation to its whole budget?

(*Dr Pope*) The strategic research programme is roughly 8 per cent.

Lord Craig of Radley

51. Following this argument on the one hand, as you put it, it is very attractive when DRA can make money on the non-defence programme because it helps clearly with the cost of the DRA to MoD, that it clearly has an MoD interest. At the same time you are saying that the DRA is primarily there to do defence work; therefore, it cannot go off on a

[Lord Craig of Radley *contd.*]

Rothschild system or anything like that. I would find, if I was sitting as Chief Executive, this places me in a very difficult position because I have to try and face two different ways. Is that the case, that on the one hand you would like to see more money coming in, but please do not go out and seek it on a non-defence activity? That is the impression I am left with.

(*Mr Bell*) Lord Craig, that is a misleading impression and I apologise for giving it. Of course, the Chief Executive must and will speak for himself. I cannot say that I have detected much sign in the numerous conversations I have had with him that this is in fact concerning him. The Chief Executive does attach high priority to the wealth creation and non-defence aspects of his business, both for reasons of the general good and because he thinks it is good for defence as customer, and we agree with him. The implication of what he is saying is that he does need customers for non-defence work. He has been quite successful in attracting them, as you know. He believes that he can double the present level of receipts. He has an extensive programme of cooperation with industry which we have described before,—Pathfinder, strategic alignment and dual use technology centres—all of which are designed to ensure that the work of the DRA does contribute to the wealth creation process. Investment by industry or the civil sector in research also spins across to our defence interest. It is my view certainly that that process is developing quite nicely.

(*Dr Pope*) I think the real challenge to the Chief Executive is to develop the external work to the extent which he has undertaken to do. It is not at all easy, in fact, to develop new markets externally. I am not conscious of any real problems of agonizing whether this or that piece of work is inappropriate. I think the real issue is generation of business.

Baroness Platt of Writtle

52. I am going to paraphrase two rather teasing statements we had from evidence elsewhere. One of them is: The DTI has the mandate to support United Kingdom industry but no money, while the MoD has the money but no mandate to support United Kingdom industry. If the involvement in dual use technology is merely a means of both MoD and DTI reducing costs, then it will fail. There is a need for MoD to change its attitudes towards supporting United Kingdom industry and for the DTI to be in a position to provide its share of the funding. That is one. The other one is that defence conversion is a development whose purity is unsullied by a single success. I accept that both of those are rather teasing but they do actually follow on the difficulties that have been highlighted in the questioning that has gone on over the last few minutes. I was going to ask question 8 *[what incentives has MoD given to DRA to encourage transfer of technologies developed within DRA to non-defence purposes?]*, but in a way I think I would change it slightly to say: How do you see that your policies might need to develop in future years to make this easier? Clearly, it does need to happen. Dr Pope mentioned that one thing might be good for defence in one circumstance but might actually be useful to the boot and shoe industry in another. This kind of thing must be very true in a lot of ways but it is very difficult to identify the area where it could be useful.

(*Dr Pope*) I think the transfer is relatively straightforward where the potential civil application is in the same industry as the defence application. Aerospace is the obvious example. I think when it comes to looking at a totally different industry, we have not really got a satisfactory answer to the problem yet. We had an entity called the Defence Technology Enterprise a few years ago which worked hard and had considerable difficulties, due in quite large extent to the difficulty of finding the funding necessary to get over the hump from something which was a defence piece of technology into an artefact which was saleable in the market. They had great difficulty. The DRA is pursuing this through its business sectors and giving them an incentive to work at this. That is probably as good a way of going about it as any but I think it would be naive to think that really we have a satisfactory answer.

53. But you and they together are trying to develop one?

(*Dr Pope*) Yes.

(*Mr Bell*) May I return to these observations? It is a gross canard to say that the Ministry of Defence has no interest in the state of its industrial or supplier base. We are constrained for resources.

54. I think the words were "no mandate", to be truthful.

(*Mr Bell*) We are constrained for resources; we are short of money. We cannot afford to spend money on things which do not clearly benefit the defence efforts of this country but we have a close and continuing interest in the technological health of our supplier base. We spend, as has been indicated, a considerable sum in ensuring that is the case. The DTI is not without resources. They are able to speak for themselves, no doubt. It is true that we have a great deal more but they do have resources which they can spend in industry and indeed with the DRA, and do so. We do see the technological health of our supplier base as important. There is a number of areas in that supplier base where there is a good interaction between civil and military technology. Dr Pope has mentioned aerospace. Electronics I regard as another very obvious case. You were shown the MESAR radar. The Gallium Arsenide technology on which that depends has become a practical proposition for us, largely as a result of the move to commercial scale production of Gallium Arsenide components over the last five years or so. As I say, we do have an interest in the state of our supplier base. Where we stop short is in thinking that we have sufficient resources to spend money on benefiting other people. Charity begins at home. So far as conversion is concerned, you quote one of my favourite quotations, an American one, about conversion. It is very much in our view a matter for the commercial judgment of our companies as to the extent to which they wish to engage in conversion. If they wish to do so, that is in our view their affair. In an extreme case, also quoting an American company chief executive, conversion consists of returning assets to the shareholders who can then invest it in civilian companies. Again, if our investment in R&D means that the companies can develop devices and

[Baroness Platt of Writtle *contd.*]

equipment with civil application, that is fine and we welcome it.

55. It must also mean that if a company that has been of great value in defence terms, which is now perhaps receiving less contracts because you have not the money to spend, can develop other sources of income, they are going to be of value to the United Kingdom defence as well as to UK Ltd.?

(*Mr Bell*) Absolutely.

56. That, therefore, means that you would have some interest presumably in the success of their defence conversion?

(*Mr Bell*) Yes, but we would not presume to dictate it.

Baroness Platt of Writtle] It is support and encouragement I am talking about.

Lord Chorley

57. The DTI has been mentioned. We asked you in question 3.7 of our call for evidence about your relations with it and in particular the LINK programme. On the LINK programme you replied to us that DRA was involved in six sectors, with fairly modest amounts of money involved, as far as I can make out, of £1.3 million a year. You say that the DRA views it as a highly effective means of technology transfer and so forth, but you go on to say, that the conditions governing the LINK scheme are constraining, in particular the requirement that the DRA's contribution should count as part of the 50 per cent HMG share, leaving the balance to be found by industry, which has undoubtedly put off potential collaborators. What can be done about it? What are you doing about it, given you say DRA says it is valuable?

(*Dr Pope*) I think that the basic concept behind LINK is a very good one but we have had considerable difficulty on the defence side in making it go well. The point really is, as you have already quoted, that if industry is putting in 50 per cent of the money or more, then it is wanting to see that money pretty well focused on the wealth-creation aspects, rather than on the defence aspects. To the extent these may be synonymous, there is no problem but, as you are all too conscious, the defence market is a declining one; the firms on the whole in LINK are not very interested in getting involved in defence-related work including electronic work on account of the amount of money they would themselves have to put in. So we have been consistently disappointed at the amount of take-up. Having said that, of course the whole intent is that LINK should be an inter-departmental programme. My understanding is that it is currently in transition to join the Office of Science and Technology. The intent is to have, I understand, a fairly fundamental look at the rules under which the scheme operates to see whether these could be made more attractive and viable in relation to not only MoD but to other departments whose research money is specifically focused on meeting a departmental or government need, rather than being aimed, as DTI funding is, very much directly at enabling industry to improve its wealth creating potential.

58. Two points arise from that. In the first part of your answer you said perhaps companies who might be thinking of getting involved in a project do not find defence things terribly interesting nowadays. That is not really a constraint. It is a natural law of economics. It is not a bureaucratic constraint. That is what one is getting at. On the other you say that there is a transfer to the Office of Science and Technology.

(*Dr Pope*) Also we have various collaborative programmes with industry, as you might expect, but it is very much a matter of negotiation as to how high a percentage they would actually put into the work. For work which is very specifically defence in nature, 50 per cent is a high percentage, particularly in a circumstance where, if some of the work is being done in the DRA, then they are not seeing the whole of the money going to their own research organisation.

59. Could it be that a slight refashioning—maybe it does not require refashioning—of the programme would be one of the ways of getting round the customer problem that we have been talking about for quite a few minutes? The LINK could actually fund some of these things where DRA see a potential.

(*Dr Pope*) LINK has got no centralised fund. Each department makes money available for LINK purposes. Our contribution to LINK is governed by exactly the same limitations as any other MoD funding.

60. You do not have a block of money allocated to LINK presumably? If the LINK thing comes up, you see if you have money to spend?

(*Dr Pope*) Where a LINK programme appears to be aligned with our interests, we indicate to the Secretariat the level at which we think we could fund that programme in the event the proposals coming forward from industry met our priorities and needs. Then obviously we do not set this aside indefinitely because we do not wish to waste defence money that is not taken up. I have to say in many instances where a LINK programme has looked very much of interest to us, the number of projects coming forward which related directly to our interests has been inadequate actually to take up the money which we were in principle prepared to put aside for it.

Lord Trefgarne

61. I would like to enquire about the position of intellectual property which, of course, the DRA generates in considerable amounts every year. Some of that, as we have been discussing, has obvious commercial applications, as well as defence applications. The cost of protecting this IPR I imagine can be quite considerable. We clearly have a case where, for commercial purposes, not directly related to defence considerations, some defence moneys are being used for that purpose. Are you satisfied the DRA is in a position, without cutting across essential principles for which defence money is voted, properly to protect the IPR which they generate? Perhaps in parenthesis I might ask: Whatever happened to Defence Technology Enterprises which at one time set out to exploit some of this IPR?

[Lord Trefgarne *contd.*]

(*Mr Bell*) On the first question, when the DRA was established as an agency, we transferred to the DRA an intellectual property department detached from the Directorate of Intellectual Property Rights, which ultimately belongs to me. As I see it, the two main purposes of protecting intellectual property are, first and foremost, to ensure that the position of the MoD is safeguarded in relation to inventions but, secondly, to ensure that the taxpayer gets a return from the money that he has invested in research. Compared with successful inventions, the process of registering patents and so on is not very expensive. Liquid crystal devices, for example, have earned royalties of around £27 million at the last count over 20 years or so. An initial patent application currently costs around £2,000 and gives a period of 30 months during which we can decide whether there is likely to be a commercial application or not. The process we adopt is one of protection by stages. We try not to protect any more than seems justified by the potential of the invention. Full patent protection can cost up to about £30,000 in a complex case, but again this is peanuts compared with the potential return on some inventions. Of course, you never know. It is rather like advertising. Half of it is wasted; the trouble is you do not know which half. This is true of these inventions. Some may be very successful; some may not find an application; some may be sleepers waiting until something else happens to become useful in themselves. On the whole we try to ensure that where there is some potential it is properly protected. The DRA has adopted that policy. I am sure that is right. So far as the DTE is concerned, Dr Pope will reply.

(*Dr Pope*) I am really enlarging slightly on what I said earlier. I would not claim to be in a position to do a total analysis of why DTE was ultimately unsuccessful. An obvious factor was that when they found technology which would appear to be ripe for some specific exploitation, right away from the industry in which it was initially associated, there was virtually always quite a large increment of expenditure still to be found to enable it to be exploited. I think there is another point. This is reiterating something said earlier. The actual cost levels in the defence industry are very different from those of devices which you might say sell in Halfords or in the high street. I have a particular development in mind here where something came out of the DRA which appeared absolutely marvellous as a potentially successful product which would sell in the high street but the odd difference of a penny in cost, in relation to an existing product, was sufficient to stop the thing going ahead. There was a number of unfortunate instances of that kind which ultimately led to that enterprise collapsing. I myself think that if the DRA business managers have got the incentive to go out and look for business, it is probably better to leave them to make the contacts with relevant industries, and then obviously with potential financial backers. It is a very difficult subject.

Lord Redesdale

62. Going back to some questions asked earlier, if a particular scientist came up with a particular idea—there has been a lot of discussion of how the MoD has intellectual rights to a particular invention—that he was working with, does he have any financial gain or reward for coming up with that idea or is it still the property of the MoD?

(*Dr Pope*) I am not clear of the precise situation at the moment.

(*Mr Bell*) Yes, he can do so. Those who were responsible, for example, for the invention of liquid crystal displays did receive an award at the time. The situation has now arisen that the invention has been a great deal more successful than anybody expected. The question which is being asked is whether, with the benefit of hindsight, the award accurately reflected this but there is that possibility. As you know, we have an award scheme for technical inventions. The man who invented the ski jump for Harrier aircraft, for example, got a considerable reward from that. Yes, there is that possibility.

63. Is that financial reward in any way on the same level as somebody in an outside industry would receive?

(*Mr Bell*) I am sorry, I cannot answer that. I think perhaps that is a point you might put to the Chief Executive.

Lord Trefgarne

64. This last question relates to strategic research and how you decide the priorities within the strategic research area. We touched earlier on as to the importance of it. You said, I think, it was 8 per cent or thereabouts. How is it that the priorities within this research programme are set? It must be rather difficult?

(*Dr Pope*) It is difficult. The way we operate it is as follows. Each year we produce a paper which is endorsed by the Defence Research Committee, indicating broadly in what areas of technology we think innovative ideas are most likely to have impact on the long term needs of the Ministry of Defence. We tell the DRA what that pattern is but we also say, "If you have any other bright ideas which on your perception of defence needs, which are outside what we said, appear to be particularly important, please put them forward as well". The DRA comes forward with a brochure of proposals each year. Then the Strategic Research Committee and specialised panels under it consisting of both independent scientists outside the MoD and MoD scientists give each of the propositions a rating from the viewpoint both of quality and relevance. On that basis we then look at all that we have received. If they are outstanding in any field which matters to us, they would obviously be above any kind of debate balancing what we will support. At the next level, very good and good, we do to some extent modulate the distribution of what we accept on the basis of our overall perceptions. This is entirely built up on propositions brought forward by the scientists themselves.

Chairman

65. Could you deal with the point about short termism? We have had a number of people in written evidence suggest that the financial regime drives towards shorter term projects. You have answered that already in your evidence by pointing to the strategic content of the framework programme.

[Chairman *contd.*]

Would you think that there is any grounds for the criticism that there is an increased amount of short term work led by the funding arrangements?

(*Dr Pope*) I do not think there is currently any justification for making that kind of statement. Clearly, this is effectively a customer issue within MoD: What work are we prepared to fund? I have each year to go to the Office of Management and Budget of the MoD bidding for funds. The level of strategic research, as you may know, is constant as a percentage of the total programme. The other issue, of course, is the balance of the rather longer term and the shorter term within the applied research programme for which Sir Roger Austin is responsible. The whole programme is put before the Defence Research Committee each year so that the committee is examining the work with this kind of consideration in mind. As I say, I see no evidence of encroaching short termism.

(*Sir Roger Austin*) My programme should be the short term one. If I have a concern with it, it is that it may well be a little bit too long term. Some of the research within the programme will not turn into in-service equipment in some cases for at least 15 years and maybe beyond that. I do not share those concerns at all; if anything, the reverse.

Chairman

66. No doubt we will have an opportunity to question further those who made this comment. I think we have exhausted the questions that we wished to put to you. Is there anything you feel we should have covered and which you would wish to remark on at this stage or are you content to leave it there?

(*Mr Bell*) I think after an hour and three-quarters or thereabouts we are content to leave it there, my lord Chairman.

Chairman] We are most grateful to you for your patience and for helping us. This is clearly an early stage of our enquiry. Perhaps we will have other questions to ask you which we may ask in a written form at a later stage. They may come up as we conduct our enquiry. Thank you very much for helping us.

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[illegible] AND TECHNOLOGY

(SUB-COMMITTEE) DEFENCE RESEARCH AGENCY

Thursday 27 January 1994

DEPARTMENT OF TRADE AND INDUSTRY

Mr R Foster, Mr [illegible] Downing, Mr S Church and Dr R Judd

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HOUSE OF LORDS SESSION 1993-94

MINUTES OF EVIDENCE
TAKEN BEFORE

THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

(SUB-COMMITTEE II DEFENCE RESEARCH AGENCY)

Thursday 27 January 1994

DEPARTMENT OF TRADE AND INDUSTRY
Mr R Foster, Mr I Downing, Mr S Charik and Dr R Jude

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THURSDAY 27 JANUARY 1994

Present:

Craig of Radley, L.	Renwick, L.
Hilton of Eggardon, B.	Selborne, E. (Chairman)
Howie of Troon, L.	Trefgarne, L.
Platt of Writtle, B.	Dainton, L.
Redesdale, L.	

Memorandum by the Department of Trade and Industry

EXECUTIVE SUMMARY

The DTI has had significant contacts with the DRA and its forerunners for over 20 years and it is these that form the basis of this evidence. Contacts range from joint attendance at committees of experts, to discussions about DTI funding for DRA. The Department has a good relationship with DRA at all levels from Chief Executive, DRA, and Chief Advisor on Science and Technology, DTI, downward.

Programmes of research on civil aircraft technology and Space make up virtually all of the planned DTI spend at DRA of £18.1m, making the Department the DRA's largest non-MoD source of income. The managerial and financial relationship between DTI and the DRA on these programmes is governed by two formal Framework Agreements.

The change in status of DRA opens up new opportunities for the Agency to collaborate with the Department in wealth creation and we are pleased with the progress made so far. It also provides the potential for DRA to compete against other agencies. This should be a catalyst for further improvements in service.

The DTI would be concerned if the new status of DRA led to a deterioration in its relationship with industry or in the ability of industry to compete in key technological markets. The continued availability to industry of major research facilities could also become a matter for concern.

In general, DTI welcomes the move to agency status. The Department has seen an improvement in the quality of service offered and believes that more will follow. Some adjustment in the relationship between DRA, Government and industry seems inevitable. This process is only just beginning.

INTRODUCTION

1. The DTI has had significant contact with the DRA and its forerunners for over 20 years. The Department values its links with DRA and considers them effective and constructive. There is close contact from senior level—Chief Executive, DRA and Chief Advisor on Science and Technology, DTI—downward. At the working level the links are particularly productive, promoting the free flow of information and ideas.

2. The DTI is the DRA's second largest source of funds after MoD. Programmes of research on civil aircraft technology and space (see below and brochures at Annexes A and B (*not printed*)) make up virtually all of the planned 1994–95 DTI spend of £18.1m at DRA. The managerial and financial relationship between DTI and the DRA on these programmes is governed by formal Framework Agreements.

3. Although the DTI is a significant source of funds for the DRA, the Department considers itself as a fund provider rather than a "customer" of the Agency. DTI-funded work undertaken at DRA (known as Intra-mural or IM research) or undertaken elsewhere but managed by DRA (known as Extra-mural or XR research) is generic, long-term research which no single company would buy. The only "deliverables" the Department receives from these funded programmes are reports on the programmes. It is a DTI requirement that the fruits of the research are available to industry, thereby fulfilling the Department's objective of promoting competitiveness. This is in contrast to the MoD, which commissions the DRA to undertake research programmes related to defence needs and receives as its "deliverables" the fruits of the research. However, in one narrow area the DTI does consider itself a customer and that is where DRA is used to assess and monitor some collaborative projects undertaken in industry which are directly funded by the Department.

CIVIL AIRCRAFT RESEARCH AND DEMONSTRATION PROGRAMME (CARAD)

4. CARAD is a DTI programme, with additional funding from MoD and industry, in support of long term precompetitive research and technology demonstration in interdependent civil aircraft technologies. The work is undertaken and funded through three mechanisms:

(a) Direct grants—collaborative work carried out in industry, with funding split between DTI and industry; the DRA often acts as technical monitor on behalf of the DTI;

(b) DRA extramural—collaborative work carried out in industry, higher education institutes, research and technology organisations and research establishments; funding is split between DTI, MoD and industry; the DRA acts both as technical monitor and contracting agent on behalf of the DTI;

(c) DRA intramural—work carried out at the DRA; funding is often split between DTI and MoD.

5. The DRA also acts on behalf of the DTI as an independent technical adviser on major assessments for launch aid to the aeronautical industry although this activity lies outside the CARAD Programme.

6. The first CARAD Programme (1990–91 to 1992–93) had an expenditure of £55.1m on research and technology demonstration (R&TD) and £22.7m for cryotechnology (mainly for the European Transonic Windtunnel). £38.2m (69 per cent) of the R&D budget was spent at or through DRA, ie £23.1m intramurally and £15.1m extramurally.

7. CARAD II, running from 1993–94 to 1995–96, has a planned budget of £56 3m for R&TD and £10.4m for cryotechnology. The proportion of the R&TD budget spent at or through DRA is expected to follow broadly the level of the first CARAD Programme—ie about 70 per cent (£39m) although the emphasis may shift slightly towards extramural work.

BNSC

8. The British National Space Centre (BNSC) sponsors a programme of space-related research and development in industry which is executed partly through the DRA. BNSC expenditure on these activities will be approximately £9.1 million in 1994–95.

Other DTI Programmes

9. The DRA is also involved in other DTI programmes. It participates in the Opto-Electronics Programme and the Molecular Electronics Programme. It has also been offered support, as a collaborative partner in projects, under the Information Engineering Advance Technology Programme, the General Industrial Collaborative Programme and other technology programmes.

DTI/DRA Relationship

10. In the past the only formal link between the DTI and DRA was the Annual Review of Civil Aircraft and Aeroengine Research which was a general review of DTI funded (ie civil) activities at DRA. The DRA's new commercial regime as a trading fund called for formalisation of the relationship with the DTI and two separate Framework Agreements were negotiated between the DRA and Aerospace Division (AIR) and the British National Space Centre (BNSC) respectively. The Agreements were in place when the Agency commenced operating as a trading fund on 1st April 1993.

11. The Framework Agreements established a formal basis for the management of DTI funded programmes at, or managed on behalf of the DTI by, DRA. They regulate a major part of the DTI's relationship with the DRA and define the obligations and responsibilities of all parties. They set out procedures on financial arrangements, reporting, Intellectual Property Rights (IPR) and all other matters which had previously been dealt with by informal negotiation. Regular meetings are held between the DRA and the DTI to monitor the operation of the Framework Agreements and resolve any difficulties as they arise.

12. The change to trading fund status has sharpened DRA's awareness of its cost structures and has given customers and fund providers a greater understanding of how money is being spent. Although DRA's financial information service (the Cost Accounting System) suffered teething troubles the quality of information now passed to DTI is superior to that of a few years ago.

13. The DTI has no evidence that re-structuring and rationalisation of the DRA is undermining its scientific and technical excellence. The DTI welcomes the Agency's new managerial and financial discipline and supports its continued progress in successfully adapting to the new competitive environment.

14. The DTI recognises that the DRA will inevitably give prime attention to its most important customer, MoD. As a result of reduced defence expenditure, the Agency is seeking new sources of funds to replace the shortfall. DRA is now paying closer attention to these new customers and the eventual market for proposed technology developments. Whilst welcoming DRA's move to a market led research strategy, the Department is anxious to see that all concerned discuss their new relationships in order to avoid the risk of adverse side-effects. For example, DRA is reviewing its facilities to see whether they can be marketed to offer profitable services to customers or whether they should be closed. DTI recognises that a balance must be struck between the provision of key resources and the need for DRA to have an overhead structure which allows it to compete effectively.

However, there could be a risk that, in carrying out such reviews during a period of recession in the industry, an underestimate of the demand for and viability of these facilities could result. Some major installations such as the 24 feet low speed windtunnel are DRA owned and are a unique facility in the UK. Their loss would impact CARAD and other industry research programmes. Others, eg the (engine) anechoic test facility, were bought wholly or partly out of DTI funds. In these cases the Department has insisted that it is consulted on any decision that may affect the future availability of the facility.

WEALTH CREATION

15. The DTI believes that wealth creation should be a major consideration in the formulation of Government R&D policies and research programmes. Since the publication of the White Paper on Science, Engineering and Technology ("Realising our Potential", Cm 2250) the relationship between the DTI and DRA has developed further. The DTI liaises closely with the DRA on its activities that have potential for wealth creation, to alert it to the need for greater competitiveness (both at national and company level) and to identify wealth creating mechanisms. The DTI and DRA are together investigating ways in which wealth creating products and processes could be realised from publicly funded R&D.

16. The DTI hopes to sign concordats with other government departments which will establish mechanisms to help bring about the wealth creating objectives of the White Paper. The DTI hopes to agree a concordat with MoD in 1994 and believes that the DRA can make a significant contribution to the success of the agreement.

17. The DTI is keen to see DRA exploit its technology base to promote the successful transfer of technology from the defence to the civil sector. The Department welcomes the potential wealth creation activity initiatives that the Agency has established.

18. The successful transfer of technology depends on the free flow of information and knowledge. The Dual Use Technology Centres (DUTCs) planned by the DRA are designed to facilitate this objective. The DTI supports the DUTC initiative and welcomes the establishment of the first centre which will be devoted to Structural Materials. Whilst the Department is not directly funding the DUTCs, a significant part of the CARAD Materials & Structures Programme will be undertaken at the new Centre. The Department believes that the sponsorship of collaborative programmes at the DUTCs, involving joint funding by industry and Government, sharing of facilities and joint ownership of Intellectual Property Rights, will act as a catalyst for increased technology transfer.

19. The objective of the DRA's Pathfinder initiative is to improve the quality and cost-effectiveness of the research programmes formulated by DRA to meet military objectives. To this end, Pathfinder provides companies with information on research needs and invites them to bid to participate in research, contributing their special knowledge and skills. The current phase of Pathfinder aims to involve small and medium enterprises in MoD research. However, the Department's exposure to the Pathfinder process to date suggests that it may be rather too demanding, in terms of management effort, for many small companies and that it may be more suited to the large defence contractors who are used to working with the DRA.

20. MoD, via DRA, is a minor player in the inter-departmental LINK scheme and its contribution is small relative to DTI and SERC. But the Department believes that the DRA has a significant role to play and hopes to see it increase its involvement. Of the 35 programmes established since the start of the LINK scheme (committed Government funding of £210 million) MoD has been a sponsor of five programmes and will contribute £2.6 million. The DUTCs may be one route through which the DRA will be able to raise its profile in LINK.

21. DTI fully supports the concept of Strategic Alignments between DRA and companies. Such relationships are best established bilaterally but DTI is willing to help if needed.

COMPETITION AND COLLABORATION

22. DRA's new status as a trading fund is leading it to reassess its business. This will have an impact upon its relationship with industry. The process has only recently begun. It is too soon to reach any firm conclusion about the likely effect. The new relationship with companies may have one or more of the following characteristics, in various combinations: a customer-contractor relationship; a collaborative relationship; a competitive relationship; or an audit relationship. Clearly, some of these types of relationship may not combine well and could lead to conflict with companies.

23. The customer-contractor relationship is to be welcomed. It has been applied first to relations between DRA and its main customer, the MoD. As DRA seeks to market its research and other services more to industry, it may be expected that closer and more structured relations with companies will enhance the effectiveness and efficiency of DRA's work.

24. At present DRA has hardly any independent resources. It depends virtually entirely for its income on customers and fund providers. However, if in future it is able to finance, in the absence of a paying customer, some work in which it sees benefit, it may be in a position to participate in its own right as a collaborative partner. It already participates, on behalf of customers, in some collaborative research. it is also engaged in discussions about collaboration with the six other aerospace research establishments in Europe.

25. As DRA looks for new sources of revenue, it may be seen increasingly by industry as a competitor for the provision of research and other services. The basis for such competition already existed before DRA

became a trading fund, in that a customer might ask DRA to undertake research (so-called IM), or to arrange for industry or universities to do it (so-called XR), but the move to agency status coupled with reductions in defence spending have highlighted this aspect.

26. The nature of the competition that DRA may come to represent is not yet clear. If a climate of suspicion were to grow up which had a detrimental effect on the close relationship between DRA and aeronautics companies (for example, where DRA competes with private industry for European Space Agency contracts), the DTI would regard this as potentially detrimental to the industry as a whole.

27. On the other hand, there are clearly some areas where DRA and industry do not compete with one another. For example Rolls-Royce plc is predominant in the manufacture of aero engines and its R&D effort and that of DRA complement one another. For many years, DRA and Rolls-Royce have cooperated on propulsion research through a nationally integrated programme. The DTI foresees no change in the present arrangements in which the Department, Rolls-Royce, MoD and DRA collectively direct the research strategy.

28. DRA is also competing in a newly created market against other Government agencies to win additional consultancy work. Customers for this kind of work, such as DTI, will now review their supply sources at intervals in order to ensure continued value for money. DRA has already bid to DTI for some work, for example in measurement and standardisation, which is currently sourced from other research establishments. Similarly other research agencies which have become trading funds, as well as private consultancies, may seek to supplant DRA in its existing business.

29. Turning now to the audit relationship, customers also use DRA as a consultancy service, for example, to help assess research proposals from companies and to manage research projects at companies. This audit role obviously implies relationships with a company whose project proposal is being assessed which are very different from DRA's relationships with the same company as a competitor or as a contractor. Where there is scope for unfair competition, or conflicts of interest, such as Pathfinder (where DRA is both the assessor of bids and a potential competitor against industry) the ombudsman arrangements put in place by DRA are designed to overcome any difficulty.

TECHNOLOGY AND SPIN-OFF

30. The DRA is the centre of excellence in some key aeronautical technologies and the DTI wishes to see the Agency maintain this role. In some technologies the individual needs of interested parties are insufficient for each to maintain a critical mass and it is essential to maintain one as a centre of excellence if UK capability is to be preserved. It is often these technologies that have a vital influence on future markets. For example, the CARAD Programme supports research across the whole range of engine technologies with expertise in individual technologies residing either at Rolls-Royce plc or DRA. This assists the UK to retain its current capability to design and build whole aeroengines, a capability currently unique outside the USA. The expertise at DRA in jet noise research helped Rolls-Royce take the lead in providing large quiet engines and may be needed in the future if changes are proposed to international legislation.

31. The DTI welcomes any consideration by DRA and MoD of the industrial implications of defence research and procurement. While the identification and achievement of civil spin-off from defence research and demonstration technology rests with the DTI, the DTI believes that DRA could play an important role in marriage broking to facilitate spin-off.

32. In aeronautics, civil spin-off from military research is an objective of the CARAD Programme. It is one of the main justifications for DTI funding of aeronautics research at DRA. A significant proportion of the DTI funded work undertaken by DRA is in programmes of generic research jointly funded with MoD. Through coordination of the research effort, the civil sector gains access to much larger military research programmes for relatively small cost.

33. The degree to which spin-off occurs is influenced by the technology involved. In propulsion research and demonstration there is a close link between defence oriented work and civil research; the nationally coordinated research programme has been especially succssful (see paragraph 27). However, in some areas civil spin-off from defence oriented work happens more through the involvement of individuals working on separate projects; this can occur for example when the DRA acts as assessor and monitor for CARAD projects.

34. The DTI is encouraging the wider use of nationally coordinated programmes in aeronautical research involving the DRA, industry and higher education institutes. The DTI has endorsed the aeronautical technologies and priorities identified by industry in the National Strategic Technology Acquisition Plan (NSTAP). CARAD funding—and hence DTI supported aeronautics work at DRA—is concentrating on the NSTAP priorities. The DTI is working closely with MoD and DRA to identify common civil and military high priority tecnologies.

35. In space technology and its applications, there is significant commonality in the technology required to support civil and defence applications. Staff at the DRA often work both on civil and military space

projects ensuring good linkage. However, there is a strong tendency now for DRA to concern itself specifically with what the customer wants (and is prepared to pay for).

36. The DRA's Defence Research Information Centre (DRIC) reports are a source of information from which civil applications may be identified. The DTI is currently considering an NEL proposal to fund a feasibility study which would define mechanisms for identifying research with the best potential for civil exploitation.

INTERNATIONAL AND EUROPEAN COLLABORATION

37. The DRA recognises that not all technology is appropriate for international collaboration. In particular, industry jealously guards its "Crown Jewels" (ie key technologies that a single company possesses giving it a competitive lead). Other areas are more suitable for international collaboration and the DTI supports any efforts made by DRA towards international collaboration where appropriate.

38. DRA is playing a role in the UK's participation in aeronautical research under the EC Framework Programme. The UK is participating in 21 collaborative projects. The DRA takes part on the same basis as industrial partners in seeking EC funds although the Agency has to find the balance of funding from UK customers. The DRA also participates in other European programmes, eg GARTEUR (a non-EC grouping aimed at strengthening collaboration).

Aerospace Division (4)

Department of Trade and Industry

5 January 1994

Examination of Witnesses

MR R FOSTER, Head of Air Division, MR I DOWNING, Innovation Policy Division, MR S CHARIK, Head of Branch 4, Aerospace Division, and DR R JUDE, Director Space Applications and Transportation, British National Space Centre, called in and examined.

Chairman

67. Gentlemen, I welcome you to this enquiry. Thank you very much for joining us. Who will introduce the team?

(*Mr Foster*) If I could introduce my team, I am Robert Foster, Head of DTI's Aerospace Division, which is responsible for DTI's interest in the aerospace sector, that is, aircraft, aero-engines and equipment but not space, which is the responsibility of the BNSC. I am also responsible, or at least the Division is, for the industrial implications of MoD procurement and co-ordinating the DTI's interest on that issue. Shelley Charik, on my right, heads the Branch responsible for the CARAD budget, which is my technical branch. Mr Downing represents the Department's Innovation Policy Division, and Dr Roger Jude is from the BNSC.

68. Thank you very much. As you know, we took evidence last week, in the first of our oral sessions, from the Ministry of Defence, and it would be helpful now to follow that by asking a few questions of yourselves. You have had notice of one or two possible questions, though it may well be that we will wish to stray a bit from that format. Perhaps I could start, quite predictably, by asking the question which is the introductory one on that note, which refers to the report we read in the press that when the present Chief Adviser on Science and Technology moves on, the post as such is not to be replaced. Is that correct? If so, perhaps you could explain the implications in respect of defence research.

(*Mr Foster*) The answer is yes, that is correct. Our position is that there are a whole range of links at all levels between the DTI and the MoD on a range of policy issues, which range from broader procurement issues to R&D. Our written evidence points out that we have good working relationships with both the MoD and the DRA, and we are working on those to get even closer. We are very conscious of the importance of the industrial implications of defence, and the President, and indeed the Minister for Industry, both having been Defence Ministers, have given us particularly strong remits to work very closely with the MoD. Obviously one cannot say there will be no change because Dr Robinson clearly has had a very close relationship with D.E.N Davies and his predecessor. Nevertheless, there will continue to be very close contacts at all levels on the science and technology side of the MoD, the procurements side, and with the Controller Aircrafts team. Similarly, we need a very close relationship with the DRA. I work closely with my opposite numbers. We will continue to see John Chisholm a great deal, working with the Agency particularly on civil spin-off and dual use issues.

69. The White Paper last year, in referring to the DTI and MoD, did demonstrate the need for each Department's Chief Scientist to be collaborating, perhaps through the OST. Do you think the lack of this particular post will make collaboration harder?

(*Mr Foster*) I will ask Mr Downing from our Innovation Policy Division to answer that. He has been reporting to Dr Robinson.

(*Mr Downing*) I think not, in the sense that what we have been trying to do in the Department as a result of Dr Robinson's leaving is really integrating the science and technology research and development interest more broadly into the whole activities of the Department. The position is that, under the new

[Chairman *contd.*]

arrangements after Dr Robinson, the Head of Innovation Policy Division will where necessary act as Chief Scientist, and that will be Dr Evans, who was previously Chief Scientist at the Department of Energy. So there will be that coverage at the higher level.

70. What perhaps comes through already in some of the written evidence we have is concern about short-termism, particularly in the DRA, with the new funding arrangements. It would obviously be very unfortunate if the new arrangements for scientific advice were also in any way to lead to short-termism. Can you give us an assurance that this is unlikely to happen?

(*Mr Downing*) The purpose of the new arrangements is, as I say, to build scientific advice and expertise into the fabric of the whole Department, and I think once we have gone through the changes necessary with Dr Robinson's leaving, you will see a longer-term view emerging, yes, my Lord.

Baroness Hilton of Eggardon

71. That is a recipe for science to vanish altogether in a sense. Irrespective of the connections with the DRA, surely industry as a whole must be the concern of your Department, and the whole future of industry in this country surely will in many ways be science-based, electronics-based, and so on. It seems worrying that you are not having somebody who is giving that push to the Department to think about that in the long-term, 20-year spans, irrespective of your close links with the DRA.

(*Mr Downing*) Yes. In terms of the longer term view of what is happening and the needs of industry, we very much hope that that will now begin to emerge from the cross-government Foresight exercise that is being co-ordinated by the Office of Science and Technology. In terms of the Department of Trade and Industry itself, we are currently organised with technology marshalled in one or two large divisions, which are not the divisions that are responsible for the industry sectors, and the purpose of the new organisation will be to bed that technology out into the divisions that have sectoral responsibility. So quite the reverse; I think there will be more of a science and technology and R&D focus in the Department's considerations of sector needs.

Lord Dainton

72. In your paragraph 3 you make the statement that the Department funds at the DRA long-term research which no single company would buy, being generic. That, I think, is in a sense what we are talking about. Are you saying it is essentially safeguarded under the new arrangements?

(*Mr Downing*) Yes. That is the intention. We will have to see how it works out, but as far as the aerospace side is concerned, Mr Foster can clearly comment on the longer-term plans there.

(*Mr Foster*) Yes. Clearly, a key part of the Department's help for strategic research which has civil spin-off activity is funded through the CARAD budget, and the level of funding for that is continuing at broadly comparable levels to recent years. That is handled by my Division, with full backing from our Ministers.

Baroness Platt of Writtle

73. Could I follow on? Aerospace is clearly very important. I happen to live in Essex, where electronics dominates the scene, and I know from the local papers that people are being laid off by the hundreds because of lack of contracts, which originally were MoD contracts. What are you doing to see that firms like that, which are mainly GEC firms, are benefiting from spin-off, to encourage diversification, so that what is a very good firm, originally in defence terms, is seeing a greater future in the civil market?

(*Mr Foster*) To answer that point directly, obviously the role of the DTI is to try and help industrial competitiveness overall. The way that the President has organised the Department is that we now have a series of separate divisions, of which I run one, the Aerospace Division, but there are others, including electrical engineering and so forth, whose job is to liaise very closely with other industries in order to find out what sort of activities the Department can undertake to help to encourage more competitiveness. They include, for example, activities like benchmarking, encouragement of the use of consultants, and in the particular case that we are talking about here, obviously things like the changing tack initiative prepared by consultants to encourage companies to think longer term on new types of markets, and this is part of the broader work which the Department has been doing on competitiveness. However, one has to say at the end of the day that the prime responsibility is clearly for the management of companies to identify their markets, and it is for them to try and find new markets.

74. It is the utilisation of spin-off from DRA research as well.

(*Mr Foster*) Again, I am sure this is an issue we will get into in much more detail, but obviously the whole focus of the CARAD budget is to encourage spin-off, and the thing I am sure we will be going into is the extent to which we can encourage the process which John Chisholm has set up and has set out in the DRA's Framework document, which reflects the establishment of trading fund status on 1 April for greater collaboration with industry and for greater spin-off, and for that to be monitored annually in the Annual Report from the DRA. We are working very closely with the DRA to encourage that. However, the best way that companies will find potential spin-off will be to take part in the DRA's efforts in that direction. Perhaps we could go into that in a little more detail as the discussion goes on.

Chairman] We will wish to come back to that later.

Lord Trefgarne

75. In the United States we have seen a move away from a purely defence-oriented defence agency, and I wonder how you would respond to the suggestion that we might be thinking along the same lines here in the United Kingdom. What would be your

[Lord Trefgarne *contd.*]

reaction to the proposition that we should change the DRA to, for example, an NRA?

(*Mr Foster*) I am certainly very familiar with the DARPA/ARPA concept. The United States is in a very different position. As we know, the DoD has been prepared to put massive funds into projects like the ARPA network, which benefit both the defence and civil supply industries. This has not been the approach in the United Kingdom. Whether that type of funding is nationally cost-effective certainly is not self-evident. Projects like the ARPA network cost hundreds of millions of dollars. There are ways in which the United Kingdom has encouraged spin-off from centres of defence research. As we know, the MoD's prime remit has been the defence of the realm, with DRA underpinning that by research rather than directly taking some of the role which the DoD has seen as its remit, which is to directly increase the industrial competitiveness of all its suppliers, and indeed, has gone rather wider than that, as we have seen so often, in the civil supply area. Given the tight budgetary scenarios, in the United Kingdom I would have thought it is very unlikely we will see the MoD starting to perform like the DoD. That is on the negative side. If I go on to the positive side, we do think, from the DTI point of view, that the DRA has a very real opportunity to build itself into a significant national technology agency by seeking a wider customer base. This is the key thing. Currently its prime customer base is clearly the MoD, and some defence customers. What the DTI would like to see is that customer base very much broadened into the civil sector. We should build on the DRA's objectives, which are set out in the Framework document to which I referred, which came into effect in April, and Clause 7.3 of that refers to entering into collaborative arrangements with industry and to developing agreements with industry to permit the transfer of technology for use for MoD purposes. We regard that as extremely helpful. We are delighted that John Chisholm has got that agreed, and we will be encouraging the DRA to move as far as possible in line with this document. If DRA can do that, quite clearly, it will have major opportunities for working with industry and becoming a much more significant and substantive national agency, but the idea of one all-singing, all-dancing, single research agency, which covers all industrial needs, has never been something that the DTI has looked for.

76. We have already heard—and you have touched on it again—that the DRA is in a position to do work for other people, including other government departments. Do they do any for the DTI?

(*Mr Charik*) The DRA is doing a great deal of work for the DTI under the CARAD programme, if that is the thrust of your question, my Lord.

77. That is the only one, is it?

(*Mr Charik*) They are also doing work for other parts of the DTI, on electronics. For example, the Malvern establishment is doing a certain amount of work. I have a long list of all the projects outside the aeronautics sector in which the DRA is collaborating with the DTI.

Lord Craig of Radley

78. I was struck by the sentence in your written report where you say, "The Department considers itself as a fund provider rather than a 'customer' of the Agency." You then go on to explain why. Perhaps you can explain how you see that sitting with the concept of a trading fund at the DRA, including in the White Paper (Cm 2250 Chapter 4, Science and Technology, Ministry of Defence), where it says that research is sponsored on a customer/supplier basis. There is obviously something quite important in your view that you are a fund provider rather than a customer. Perhaps you could explain why you see it in that way.

(*Mr Charik*) It is a subtle distinction, but it is quite an important one. If you compare our position with that of what we would call the customer—and, of course, the MoD is the main customer at the moment—the MoD actually has operational needs which require it to carry out research, and it gives contracts for that research to be carried out at the DRA. There there is a direct supplier-customer relationship. The DTI, as far as civil aeronautics is concerned, is not in that position; we do not actually have operational requirements which require us to carry out research which we then ask some contractor to provide for us. We are in the position, as we are across the board, of trying to promote competitiveness in industry, and one means of doing that is to encourage essentially longer term research which, as was mentioned earlier, is the kind of research that single companies might not find it economic to do on their own. We encourage this with grant aid funding. That is our relationship with the DRA. We are encouraging this long-term generic research through the provision of grants. Although the distinction seems a subtle one, it is actually quite important in a number of different ways. It does not affect directly the way we are treated by the DRA, that is, they treat us in much the same way as they would treat a real customer, but it does affect the tax position considerably, and it is a distinction which we feel we need to preserve.

(*Mr Foster*) It is difficult to define the customer/contractor relationship, as Mr Charik is pointing out. Quite clearly, the DTI is not a customer in the sense that the MoD is, and the DTI to some extent has this awkward role of acting as a "proxy customer", in a sense, for industry. Ideally, contracts would be given directly from industry, and the DTI would not be doing this. Nevertheless, in areas where industry cannot get the full benefits that it wishes, it makes sense for the DTI to be in close contact with industry to try and find out what its requirements are and to reflect those in the sense of a proxy customer. This is one of the problems with the broader customer and contractual relationship.

79. I have forgotten the precise percentage, but a not insignificant percentage of MoD work given to DRA is given by the Deputy Chief Scientific Adviser, which is on long term research as opposed to direct and related to operational requirements. My question then would be to what extent are DCSA's remit and your remit, which seem to fit much the same sort of broad description, harmonised, or is there any harmonisation, so that you are not

[Lord Craig of Radley *contd.*]

repeating yourselves, whether in aerospace or anywhere else?

(*Mr Charik*) There is a great deal of harmonisation. I can only speak specifically for the aeronautics side, but with both the work which is promoted by the Chief Scientist side of MoD, the strategic programme, and the other work, which is the applied research programme, which is a rather larger amount, there is a great deal of collaboration between DTI and MoD in trying to identify dual use technologies, and very substantial numbers of projects are jointly funded in this way. It is one of the chief rationales of the CARAD programme to identify these dual use areas in order that DTI funding can leverage more of this dual use technology out of defence and into the civil area.

Lord Howie of Troon

80. At round about the middle of paragraph 3 of your memorandum you say, "The only 'deliverables' the Department receives .... are reports on the programmes", which is sensible enough. Then you go on to say, "It is a DTI requirement that the fruits of the research are available to industry." How do you do that? Do you just publish the report, or do you do something more elaborate?

(*Mr Charik*) There is something more elaborate. The DRA is responsible for dissemination in this way, and they do it through a lot of different methods, including publication of reports, but also a lot of seminars and meetings. There are so many meetings during the year that I have great difficulty in finding time to attend as many of them as I would like to. One of the problems with collaborative research is that people spend a great deal of time talking to one another rather than doing research.

81. The report is to your Department, and then is it distributed by the DRA?

(*Mr Charik*) The report is a report on the progress of the research. This is to make sure that we, as funders of the research, are aware that deadlines are being met, milestones are being achieved; in other words, it is about the progress of the research. When the research is complete, however, and the findings are known, it is those findings that are then made available.

82. If you look at the executive summary, in the last paragraph at the bottom of the page, you welcome the agency status, and then say, "The Department has seen an improvement in the quality of service offered and believes that more will follow." This has not been going on for terribly long. I wonder what sort of evidence you could produce to back up the statement that there has been an actual improvement.

(*Mr Charik*) I think that the first thing to say possibly is that the improvement has not just suddenly begun with the creation of the trading fund status of the Agency. It has been going on for longer than that. The first real step on that road may have been when the Ministry of Defence introduced package management for some of their research programmes. That was a tremendous impetus for the DRA to focus more on customer requirements, and I think that started to generate a more customer-orientated attitude from that time. It is now some years ago. From our point of view in the DTI, if I went right back several years, a sort of caricature of the DRA's attitude—a little unfair perhaps—would be something like the DRA thinks up what needs to be done in terms of long-term future research, comes along and presents a set of ideas to the DTI, and more or less expects that a grant will be provided which will keep them all busy for the next year, and during the year they will tell you a bit about what they are doing, but they would not expect you for a moment to disagree with what they were doing or tell them to do something different. It was a cosy relationship. As I say, that is a bit of a caricature, but if you compare the situation today, we now have a framework agreement with them which sets out exactly their role and responsibilities. We have quarterly reports from them. To give you an example of their customer orientation, they came to us and said, "What do you want to see in the quarterly reports? What sort of information will be valuable to you?" I do not think that would ever have happened three years ago. Their attitude has improved right across the board. That is just one piece of evidence of it most recently, but generally if there is any kind of problem, we only have to pick up the phone and they will move Heaven and earth to solve whatever that problem is straight away.

83. So you are saying that this improvement has been going on for quite some time before the trading fund was established. Are you telling me now that the existence of the trading fund status has accelerated this process or is it possible that it has led the DRA into a short-term view of quick results?

(*Mr Charik*) No. First of all, I would say on the quality of reporting and the general customer orientation of the DRA that the process has accelerated since the trading fund status began, and I would not say that this is leading to a short-term attitude at the DRA at all. It is only fair to the DRA to point out that as a trading fund, they are now responsible to their customers, and if their customers give them a great deal of work which is short-term in nature, I do not think they would then be responsible for the fact that most of the work they were doing was short term. In fact, though, that is not happening; as far as my own CARAD programme is concerned, that remains with a very considerable long-term emphasis.

84. Yes, but if you are obliged to give a quarterly report, there is usually supposed to be something in it, and that would incline you to produce something you could do in three months.

(*Mr Charik*) No. One must not confuse the contents of a quarterly report, which is for the management of the programme. The programme itself might well be a five- or ten-year programme of work, or a three-year programme of work intended to fit into a long-term research strategy. That does not mean that you should not have milestones which you must achieve regularly throughout the course of that research work. So what we are talking about is management methods for research. The fact that you must make a regular report on the milestones which

[Lord Howie of Troon *contd.*]

you have achieved does not mean you do not have long-term objectives in the research.

85. It is very sensible. I do notice that the quarterly report has diminished in importance since you first mentioned it.

(*Mr Charik*) I would not have said that. I think the quarterly report is actually irrelevant to the question whether the research is long-term or not. It is relevant to the customer-orientated attitude in the sense that they are giving their funders and their customers really good, detailed information of the progress they are making and the way in which the money is being spent. I do not think there is any contradiction.

(*Mr Downing*) I visited the DRA last week, and was certainly most impressed in talking to the top management on the emphasis that is now being put on John Chisholm's initiative on milestones. They are obviously very wide-ranging and there is a tremendous consciousness of the need to reach a higher percentage of those milestones on time, as indeed I see John Chisholm reflected in the evidence that he put to you.

Chairman

86. Can I move on to funding matters. Last week the Ministry of Defence made it quite clear—and reasonably so—that their funds were for defence programmes and for defence purposes. You in your evidence make the point that you are the second largest source of funds after the Ministry of Defence, and that your programmes of research are mainly on civil aircraft technology and space, which is quite specific. That is virtually all of the planned 1994-95 spend of £18 million. What I think would be of interest to the Committee is to hear how you feel these very specific funding arrangements are going to allow the DRA to provide facilities, and indeed possibly programmes, which at the moment are not perhaps so clearly defined, but which may well be needed in the longer term. There may well be a need to retain a capacity the need for which has not been clearly identified yet but which may well be needed in the future. Will these very stringent Treasury requirements to account, in your case, for the specific programmes and, in the case of MoD to make sure that there is a specific defence content, inhibit the DRA in widening its base?

(*Mr Foster*) It is a complicated question. I will ask Mr Downing and Mr Charik to comment on it too. Obviously, there is the general Treasury requirement of obtaining good value for money, which we all operate in Whitehall, and there is obviously the related key issue on how that should be interpreted, particularly in the case of defence procurement. We indeed want that to be interpreted in a long-term way in terms of full life cycle costs, especially in the case of procurement. In order to examine the industrial implications of any defence expenditure at the DRA or wherever, there is more likely to be full weighting given to the industrial implications if there is a long-term view taken of value for money rather than short-term. So the longer the view the MoD can take on particular strategic purchases, and indeed towards R&D, the more effectively we are able to work with the MoD in examining the industrial implications of decision-making. This is extraordinarily important, and I will ask Mr Downing to explain the impact.

(*Mr Downing*) The rule that the MoD can only spend money on R&D that is directly relevant to defence requirements—and there I stress the word "directly"—has undoubtedly placed constraints on the degree to which it has been able to participate in general collaborative R&D programmes, where the agenda is largely set by industry rather than any defence requirements. An example of that, of course, is the LINK scheme. We could take the pragmatic view that all research is in some way, to a greater or lesser extent, likely to be relevant to defence, but it is only a limited amount of that that is deemed to be directly relevant, and thus eligible for funding. So there are constraints imposed by the rules, and it probably is not just so much a question of the rules; it is a question of the role of the Ministry of Defence and the role of the DRA, and the way that those rules are interpreted to allow it to achieve its objectives. I would anticipate that this is an issue that the MoD is clearly going to have to work through in its own mind as it comes to terms with the wealth creation thrust of the White Paper. These are issues that clearly will need to be revisited, but undoubtedly there are constrains imposed by the rules.

87. Would "revisited" mean the same as "relaxed"?

(*Mr Foster*) That would pre-judge the outcome of the revisiting, my Lord.

88. You have an interest in the DTI to ensure that there is dual use and satisfactory cross-fertilisation. It does sound from what you have just said as if you feel that these are real constraints imposed by the Treasury rules which you at the DTI would like to see relaxed. Am I putting words into your mouth?

(*Mr Downing*) I am tempted to say yes, my Lord. It is true that over the last nine months relationships at policy level and talking at the policy level between the MoD and DTI have improved quite markedly as we have begun to discuss with each other the implications of the Government policy and the White Paper. From the DTI's point of view, our objective is quite clear. We want greater access to the enormous resource of defence technology. We want access to be made readily available to industry, because we believe that the country has invested an enormous amount of money into that science base, and that we really ought to be diversifying it. We have a number of plans, and discussions are going on with the DRA and MoD as to how we might do that. We are most anxious, for instance, in the work that our Department is doing on establishing networks for linking industry with the science base, that the DRA and the defence technology base should be an integral part of that network and be a resource on that network, available to industry. So it is not that we are doing nothing about it; we are actually looking at what we want to do, and I think from the discussions that MoD and DTI are at one on what we would like to see achieved. But we will have to work out the implications, and undoubtedly one of the implications is that we are going to have to revisit some of the rules that currently constrain what Government has decided MoD can spend money on.

Lord Dainton

89. I think we are at one, to use your words, with you in wanting to see that what you described as the immense research resource of the DRA is put to civil use. Indeed, that is the theme all over Europe and North America at the moment, is it not? One of the things that we find very puzzling is in question 5 *[The current LINK rules specify that only fifty per cent of a LINK programme can be Government funded and for this purpose DRA support counts as Government funding. It has been suggested that this discourages a joint industry-DRA bids and that how that the DRA operates a trading fund it should be regarded as an industrial partner as far as the LINK scheme is concerned. Would the DTI like to comment upon this suggestion?]*, where one makes a defence research agency wash its own face financially and live on an income which it earns, and which gets into bed with an industrial colleague to do something jointly, which seems to be wholly ideal, but then it disqualifies itself because of some arcane rule from getting any further government support. Is that one of the impediments or do you not see that as an impediment?

(*Mr Downing*) Whether it is an impediment, it is certainly an issue that has to be looked at. That particular constraint has impacted upon the degree to which the DRA, for instance, has been able to participate in the LINK programmes. I think now that the Government has reaffirmed, through the S&T White Paper, that LINK is an essential mechanism for encouraging collaborative research and development and co-operation between industry and the science base, it is timely also to revisit the LINK rules.

90. May I interrupt and ask you with what intention would you be revisiting, or would it be a courtesy call?

(*Mr Downing*) No, not at all. It is true to say that, with the change in emphasis of the DTI's policy following the White Paper, and our concentration now on the exploitation of technology and its transfer and diffusion rather than the generation of technology, which we see as a matter for the science base, then indeed the present LINK rules are not very conducive to what DTI wants to do either. So from our point of view in the Department, and I know from the Office of Science and Technology's point of view, we clearly now have an opportunity to stand back and say, "We have reestablished LINK as a mechanism. Can we go back and make it more flexible?" From the point of view of our Department, we are looking for the greatest possible flexibility to mix and match resources within a mechanism like LINK to the benefit of all participants. In terms of the status of the DRA, I would hesitate to be prescriptive. Hitherto it is true to say that the DRA has been considered as a science base partner and the current LINK rules have counted as Government contribution any work that has been done within the DRA. I would envisage for the future that it could be regarded as either a science base partner or an industrial partner, depending on the conditions of its participation. One consequence under current rules of DRA being regarded as an industrial partner under LINK is that, with all industrial partners, it would have to bring cash or resources in kind to the partnership from its own resources that did not originate in public funding. So there is a down side under the present rules of it being regarded as an industrial partner at the moment.

91. Can I go on to another issue related to this. Account is given of CARAD as a good example, as I take it, using the jet engine as the case, of ways in which the Defence Research Agency and industry can get together in something which has civil applications as well as military applications. Can you tell us whether there are other areas where you, from your standpoint in the DTI, can see DRA making a contribution and stimulating industry to become active and profitable? There are not any other examples one can see apart from opto-electronics and things of that kind. If so, do you think the new status of the DRA will make it easier or more difficult to get these things out into industry?

(*Mr Charik*) In a sense they have more of an incentive to do that now, because they are trying to broaden their customer base. If they come up with a licensable invention, they have an opportunity to earn licensing income as well. So the trading fund does give them quite an incentive to try and do more along these lines.

92. Is there any guarantee that they will be able to retain the licensing income profit or that this will not be clawed back by the Treasury?

(*Mr Charik*) I do not know.

93. For your argument to be true, that guarantee should be there.

(*Mr Charik*) They should be allowed to retain some, and they certainly are allowed to retain some at the moment.

94. Is it a large or small percentage?

(*Mr Charik*) Of their income?

95. Yes.

(*Mr Charik*) At the moment I believe they are allowed to retain the totality of their licensing income, but it is a small proportion of their total annual revenue.

96. If it grew too large, that would become visible, and then it would become debatable.

(*Mr Foster*) It is an issue, if I might say, my Lord, we have suggested the DRA should discuss with MoD.

97. Clearly, it must be a matter on which to determine their attitude. I interrupted you. You were going to give us some other examples and also perhaps tell us whether its capacity is increased or diminished.

(*Mr Charik*) There are a lot of examples within CARAD of the spin-off work. It is not just jet engines; it runs throughout the civil aeronautics programme in avionics and in materials as well. There is no shortage of examples there. There are also a number of areas in electronics outside avionics where there has been quite a lot of spin-off.

(*Mr Foster*) I have been heavily involved in that in the past. I know this is one of the questions put to us on the value of places like Malvern. Quite clearly, there are major strengths in the DRA in areas like software engineering, computer security, and various other sectors such as opto-electronics. We have DTI supported programmes in information engineering through ATPs, the Advanced Technology Programmes, e.g. gallium arsenide programmes, and

[Lord Dainton *contd.*]

we obviously welcome the efforts which the DRA are now making to systematically look at its skills and how those should be opened up. One of the key initiatives is the new dual use technology centre concept. We talked last week to the new manager, who has just come back from the United States, on structural materials. We think that is being handled in a very professional way. It is quite clearly an area where the DRA is strong, and we were encouraging them last week to look very actively at other areas, like software engineering, where obviously there are very strong skills at DRA, particularly in areas like safety critical software and formal methods, and all the signs that we received from the DRA in our discussion and from the evidence that John Chisholm has given is that they actively hope that these dual use centres will be a success and want to build on them.

98. How do DRA and particular industries get together? Do you see yourself in any way as a marriage broker or, now that they are a trading agency, is the marketing of their own goods to be solely their concern?

(*Mr Foster*) The answer to that is primarily that it is a business, and I am sure John Chisholm has certain targets which he intends to meet, and it will be up to him to perform on those. However, we are working very closely, and I am quite sure he will be looking to us in various areas, LINK or whatever, to act as protagonists.

Baroness Hilton of Eggardon

99. Surely the role of the DTI is to provide a strategic overview of British industry, and if there is a development in liquid crystal displays or carbon fibre materials or whatever, should you not have some role in telling the whole of British industry that there is this exciting development which may have all sorts of uses? I cannot understand how it is purely on a DRA individual company basis. It seems to me you should have an overall strategic role in this.

(*Mr Downing*) Indeed, we will. I mentioned earlier our plans and the work that is going on at the moment to set up business links to, amongst other things, help link industry with the science base. In that context, as I say, we see the Defence Research Agency as very much part of the science base, and in that business link environment the primary role of DTI will be to broker people with needs in industry with a skill base that can respond to those needs. I am in active discussion with the DRA on how we may put that together, and how we might orchestrate the DRA skill base as a resource on that network. So we will be working in that mode of acting as a signpost between people who have needs and people who have skills within the DRA. The other aspect that my colleague has referred to are the plans to establish the dual use technology centres within the DRA. One has now been set up in structural materials. There is a whole list of others that DRA has in mind to establish. Again, we are in discussion with them to see whether it might not be possible for the planning and the implementation of those centres to be a joint activity between the two Departments. Those discussions are at early stages, but clearly it will facilitate the type of spin-off and interaction that we are trying to achieve.

Lord Renwick

100. We have discussed a lot about dual use today, and I believe there is possibly some misunderstanding between the DRA itself and the defence industry, that is, all those companies out there who are very involved in defence activities. Let us take them first. You have reported a study a few years ago of the spin-off of defence research into civil activities, which was in fact, after careful examination, quite considerable; I think it involved something like £3 billion a year. I am wondering whether that report has been followed up since then, and whether there is evidence of the ways in which that value to civil use was taking place, but not obviously and not regularly throughout various companies who were much better at it than others, and whether that information has been applied to help the DRA do it itself. Let us face it, we have the DRA in a situation in which it is now possibly having to compete with our larger defence companies. The MoD and yourselves sit in Government. It seems that the DTI has the mandate to support British industry whereas perhaps it is the MoD that has the money. This is a comment that has been made to us in written evidence, as I believe you know. It is also a question of whether the DRA's resources and capabilities—this is a further difference—should be kept for the use of the Ministry of Defence rather than as part of the United Kingdom's total research base. I anticipate your answer will be that that is in your interest.

(*Mr Foster*) There are a whole series of questions there. The first one—just remind me if I missed any—was on the study which was done on the £3 billion spin-off, and yes, obviously that study was a very important study and obviously a major part will be between the defence and civil side of the aerospace industry; defence technology is not necessarily just going into new squash rackets or whatever. There is a great deal of spin-off going on within sectors like aerospace from defence to civil. It has been suggested to the MoD that that report should be updated. It is the sort of thing that is probably sensible to do every five years or so. These are very broad, ball park figures. In terms of monitoring, in terms of tying to get a further handle on the statistics, I would have thought the next key phase will be, as set out in the White Paper, through the Annual Report from the DRA. Clearly some sort of performance targets for spin-off, at least from the DRA, have to be agreed. Ian Downing may be able to comment more. Clearly, there are discussions going on between the Office of Science and Technology and the Ministry of Defence on how to define those targets and what would be appropriate for the DRA's Annual Report, because they too will need to be reflected in the Forward Look document. The first document is due in April, and then subsequent years. I suspect detailed performance figures may not be this April, but may be the following April. In the Forward Look document we will start seeing helpful targets which will give us a better handle on the extent of spin-off from the DRA coming into the public domain.

(*Mr Downing*) I think it is an important area. There is undoubtedly a lot of spin-off that goes on at the moment, but traditionally that has been spin-off between the Ministry of Defence research

[Lord Renwick *contd.*]

programme and the defence industry. Our view would be that that is quite cosy, but as the world situation changes, of course, there is going to be less requirement for a defence industry of the size that we have, and we do need to get greater diversification. More importantly—and I think it is key now to the DTI thrust—we want to get the spin-off from the defence technologies not just into the traditional defence industry but to the whole of the United Kingdom industrial base. Once most defence technology gets to an application stage it is not actually dual use, because it is specified in a different way. What the DRA has is a fundamental world class capability in the generic sciences and technologies that underpin both defence applications and civil applications. It is the fundamental skills of the chemists, physicists, mathematicians and engineers that we want to find a mechanism of accessing.

Lord Renwick] In no way do I want to be patronising, but it is vital that the DTI do see that it is part of their role to ensure that British industry is capable of making the sort of profits that can generate money for research at the sharp end, that our defence industry is capable of being at the forward edge.

Baroness Platt of Writtle

101. You say you are trying to find an answer to industry accessing relevant information. This is a very difficult question. Do you think you are achieving progress on that road?

(*Mr Downing*) Yes, I do. The dialogues that have now started since last July have, I think, put the DTI and the MoD on a course of common cause. There are some difficult issues, which we have already discussed this morning, that have to be addressed. In the past I believe they would have been seen as insurmountable obstacles to making progress. My sense now is—and I think there is a sense right around Whitehall—that these constraints now are seen to be obstacles to overcome, and that there now is a convergence of purpose, that we do have to find our way round those problems and, if necessary, make the required cultural change in the way that we think about things in order to do that. I believe the will is there now.

102. When Dr Pope gave us evidence, he said, "Something that we discover might have a spin-off in the boot and shoe industry, but it is how we get the access from the boot and shoe industry."

(*Mr Foster*) That comment is absolutely excellent. The problem some years ago in terms of trying to identify potential areas of exploitation was that there was this ferret idea, that one could put ferrets in to defence research and they would know that there was an application in the boot and shoe field. The point is that people simply did not have the breadth of market knowledge to be able to do that. Hence there is a rather different approach now being suggested. It is threefold. What we are saying is that there need to be performance targets for the people actually involved in the defence research that they themselves undertake, because it will affect their pay or whatever, to find wider applications. There is that activity. There is a second one which the DTI needs to be actively involved in, in trying to help the DRA to identify these new areas—software engineering, materials, for example—in order to make sure we are strategically feeding into the DRA as we hear from industry what they want done. Then there is the third activity, which is making sure that boot manufacturers, or whoever is asking the question "Is there something in the DRA?" are able to find out, which hopefully they will be able to find out better through the new DTI business link activity. It is a rather different approach. We will have to see how effectively it works. At least there will be methods of monitoring this more than there have been in the past through the DRA's annual review and through the Forward Look activity.

Lord Dainton] One point here, which is the perennial problem of British industry, is that those people who need the knowledge and techniques and technology and are not successful are often those people who do not know that they need it. Whose job is it to solve this problem? Is it the DRA in relation to what it has to offer them, or is it yours to increase their awareness and educate them, or is it not a problem any longer?

Chairman

103. Is this where Darwin's theory of evolution comes into play?

(*Mr Downing*) My Lord, I think it is for both. I think it is for the DRA to be looking outward, as clearly it will now, as it begins to expand its customer base, looking outward towards the need that it can satisfy on a customer contractor basis. As I have indicated, for our part, we are trying to put our delivery mechanisms as a Department out there with industry in the regions instead of trying to run things in a central, co-ordinated way. So it will be one of the jobs of the business links and the innovation consultants that we are associating with them out there in the regions, in the business link offices, what used to be called One Stop Shops, to really get close to industry and help industry to identify its need. I think you are right, my Lord, in saying that it is often the case that industry does not actually know what it wants, and that makes the matching of the available science and technology and that need, the more difficult, and it does need the brokering role that my Department is now working on.

Lord Redesdale

104. It states in paragraph 19 that the Pathfinder programme may be too demanding for small companies in terms of management effort. Does the DTI see this as a problem? In paragraph 19 you say it is quite likely that small businesses will be pushed out of the market and only large contractors will take part. Are you doing anything to combat this, or is it a process of natural selection?

(*Mr Foster*) There is a wider issue here on how one gets smaller companies in any case involved in government and indeed European-type activities. It is one of the regrettable facts that, when you look at any national schemes or European schemes, it is exceedingly difficult to get at the great swathe of medium and small companies. Against this background let us look at Pathfinder.

[Lord Redesdale *contd.*]

(*Mr Downing*) I think it is generally true that participation by industry in any government scheme has overheads associated with it. Putting together detailed and credible proposals in a very competitive market necessarily requires quite a lot of management effort. It is difficult to do, and it undoubtedly is true that that burden, the overheads burden, falls disproportionately on smaller firms. As far as something like the Pathfinder initiative is concerned, where we are trying to get smaller firms involved in defence research, it is still very early days. We are very much on a learning curve. The DTI became involved in that particular DRA initiative for the first time in 1993, albeit at a rather late stage. Indeed, we did manage to get involved in that exercise six or seven relatively small firms that traditionally had not been involved with the defence sector. For subsequent Pathfinder rounds and activities such as that, I hope to be able to work very closely with the DRA, both in the planning and the promotion of them as part of our general policy for small and medium sized enterprises, and also because of the desire that I have expressed earlier to see far greater access for the civil industrial sector to the defence market and the defence technology base. It may well be that the DTI has a role helping small firms with this overhead cost, and it may well be that we could consider schemes that would assist small firms to become more easily involved in those types of activities.

105. Would that help take the form of grants or sending people into the industry themselves?

(*Mr Downing*) We have not considered it in detail. There has been a thought—and it is merely a thought; it is not policy—that there might be a role in providing grants to cover the overhead costs of preparing bids for small firms, which would help them get into the process, undoubtedly through the business links which I repeatedly refer to. We are going to provide consultancy, or at least, we are going to provide a mechanism for paying for firms to get consultancy to help them answer some of these problems. We are at the early stage. We are on a learning curve, but there clearly are measures that could be taken, and they are being actively considered.

Lord Trefgarne

106. I would like to touch upon what I think is perhaps one of the most crucial points that has emerged from some of the evidence in the written paper that you put in, and that is the risk to the civil sector of the removal of some of the key facilities available within the DRA, up to now mostly used on military work, no doubt, or defence-related work, always perhaps having had a small civil requirement, which will continue, but which is not in itself sufficient to sustain the facility, which is nevertheless crucially important. There was some evidence from your document that you too are concerned about that, and I wonder what you see to be the solution to that.

(*Mr Charik*) You are quite right that we are worried that it might become an area of concern. We do have an agreement with the DRA over a number of facilities which we have helped to fund in the past, and they have agreed that they will not close any of those facilities without consulting us and giving us an opportunity to see what can be done. There are still a lot of other facilities where the DRA have no such agreement with us. They are seeking to market those facilities, and indeed, in some cases they have already had very considerable success in marketing those facilities, and ensuring that they will have an adequate base load of work into the future, and there will not be any need to close them down. Even if the DRA were not a trading fund, I think that it would be only right, in the interests of getting good value for public money, not to spend very large amounts of money on facilities that are not fully required, and once the DRA is a trading fund, of course, it then has a built in financial mechanism for determining whether these facilities are required, or can be cost justified or not. Even so, at the moment, as the Committee will know, the aeronautics industry is in recession and there has been simultaneously a cut-back in defence expenditure, and this does lead us to worry that possibly decisions on the future of some facilities might be taken against that rather gloomy background on too much of a short-term basis, without looking at the demand that there might be for such facilities when the economy in civil aeronautics recovers. I must say at the moment no decisions have been taken which would give us any cause for immediate concern, and we will be keeping the situation under very close watch.

107. You have said that your oversight did not cover all the facilities in the DRA, so some important ones might be closed without you knowing.

(*Mr Charik*) They will not be closed without our knowing because, as I say, it has been agreed that, although they do not formally have to consult us, we are in daily touch with the DRA on all these issues and there is not any question of them doing anything without us knowing about it. In fact, for example, we are fully aware of their site rationalisation plans, which must involve something happening to some of their existing, older wind tunnel facilities, if only because the gentleman who used to do my job at the DTI is now in charge of that very department at the DRA, and I talk to him on the telephone nearly every day of the week. We are in very close touch and know exactly what is going on on the ground at the DRA.

108. My reaction to that is that it may be splendid making sure your chum rings you up before anything happens, but perhaps it ought to be a rather more formalised and better organised approach.

(*Mr Charik*) I think we are going to be kept very fully in the picture, my Lord. I do not think there is the slightest chance of them deciding to do anything without us being well aware of it in advance, even in those areas where there is no formal agreement that they must consult us.

(*Mr Foster*) Obviously if Mr Charik is given early warning a report would go straight to DTI Ministers so they can decide what view they wish to take.

109. So there is a concern to do something about it.

(*Mr Foster*) There is indeed.

110. That is a decision for Ministers.

(*Mr Foster*) That is a decision for our Ministers.

Baroness Platt of Writtle

111. You say that you hope to sign a concordat with other government departments to achieve the wealth creating objectives of the White Paper. "Hope" is a slightly doubtful word. What difficulties do you anticipate that there might be with the Ministry of Defence in reaching such a concordat?

(*Mr Downing*) I must apologise. This is a case of less than rigorous drafting. You must be clear that the word "hope" is not intended to imply any uncertainty or anticipate any difficulty that we will in fact secure a concordat with the Ministry of Defence. It is merely that we have not started the process of negotiation yet. Indeed, from the Department's point of view, the priority has been to secure concordats with the six research councils. That work is now well advanced and once it is over the resource will be put into the concordats with the MoD, which I think, my Lords, will be able to pick up some of the concerns and the formalisation that Lord Trefgarne was speaking of, and we shall also be concluding concordats with other government departments. All I can say is, in terms of going into those negotiations, from where I sit now and on the basis of preliminary discussions, I do not anticipate any unresolved difficulty to come in the way of a satisfactory conclusion.

112. Could I just ask a very short question. You mentioned what used to be called One Stop Shops; what are they going to be called now?

(*Mr Downing*) Business Links.

Lord Howie of Troon

113. Chairman, we have just heard about concordats with various people, and a few moments ago we heard about an agreement with the DRA. Is a concordat different from an agreement, and if it is, how? It is a very high-toned word.

(*Mr Downing*) It is. What we intend by concordats is that they should be framework agreements. They should set out the general parameters of interaction, and then should be supplemented by agreed annual work programmes, where again we can have targets for working together and specific objectives, but really they are outline agreements which define the operating parameters of the relationships between the Departments.

114. So the agreement with the DRA is a much tighter thing?

(*Mr Charik*) Yes. It is absolutely specific.

115. That leads me to a thought. I was under the impression that the general aim of this whole thing was to make the DRA more independent as a business eventually. I get the impression from this agreement and your activities on the telephone every day that they are not all that independent. They seem to be fairly tightly—if not controlled, at least fairly tightly—looked at. Is there some confusion here in the strategic aim?

(*Mr Charik*) No, I do not think so, my Lord. They are completely independent at the end of the day. Quite honestly, if their overhead structure is unsustainable, they would have to be allowed the commercial freedom. John Chisholm's job is to run the operation on that basis, as a trading fund, and we would not want to see him fail because of his overhead structure. So the agreement with them is an agreement for consultation in a case where actually the DTI has a financial interest in the facilities concerned. I would not regard that as an infringement of his independence.

116. It is not usual for the shareholder to be picking up the telephone every day and badgering the operator, is it?

(*Mr Charik*) I think you are putting words in my mouth now. I did not suggest that I was picking up the telephone and badgering him every day. I talk to him regularly on a whole range of things, and this is one of them. It is a matter of continuous interest to the Department.

Lord Craig of Radley

117. In your evidence at paragraph 26 you say, "The nature of the competition that DRA may come to represent"—that is, with industry—"is not yet clear." In the evidence we have received certainly some sections of industry at least believe that the introduction of competition between DRA and industry in such areas as the European Space Agency contracts, as an example, could be damaging to wealth creation in the United Kingdom, and you certainly—and I would agree with you—suggest that if a climate of suspicion were to grow up, this would be detrimental. I wonder whether you would like to address that point and say what you believe should be done to avoid a climate of suspicion developing. Could I follow with a second question? It is related to competition. You say at paragraph 28, "DRA has already bid to DTI for some work, for example in measurement and standardisation, which is currently sourced from other research establishments", and indeed vice versa. I was not very clear whether those other research establishments were also government funded ones. Are we in danger of seeing a case of dog eat dog?

(*Mr Foster*) Obviously, what we are hoping is that the DRA's entry into the market will be in the long term on a complementary rather than a head-on competitive basis. We will have to see how it develops. Clearly, DRA's skills are in the longer term strategic research area. When you look at the work of contract research organisations or consultancies, who might see this as competition, they tend to be into the nearer market rather than longer term R&D. We will have to see how that turns out. Clearly, as John Chisholm has pointed out in the evidence he has given to you, the fact that there is an element of competition will make the DRA sharper, and the fact that it has been set-up in this competitive way must be healthy nationally. There is a down side if it is overdone—you are right—because research resources are very precious in this area. Obviously, the DRA is being encouraged to look for other customers. Not all of those customers will be in industry. Some of them will be in industry, some of them will be in other government departments. There is no reason why one agency should not compete for the work of other customers, if it keeps other agencies on their toes. If it were to turn out that DRA gained a major part of the national measurement system, that would be highly concerning for the future of the National Physical Laboratory, and damaging to the NPL. That is not what we are hoping will come out

[Lord Craig of Radley *contd.*]

of an effective internal market for research agencies. But we hope there will be an element of competition and greater complementarity.

(*Dr Jude*) On the space side this has not been a major problem over the recent past. In fact, over the last two years there have been some 800 to 900 contracts per year let to United Kingdom industry by the European Space Agency, and the DRA has taken three contracts over that period. We have had no indication ourselves from industry of complaints of competition from the DRA. They have won certain competitions where they have certain specific unique technical expertise, and they have also won contracts in collaboration with industry, and we would hope in the future that they would continue to collaborate with industry, with industry and the DRA each bringing their strengths to individual bids, and we believe that if that were to happen, and contracts were to be won from the European Space Agency, that would in fact help the transfer of technology from the military to the civil side, and would be beneficial to the overall wealth creation of this nation. So that is an area where we will be encouraging the DRA to bring its strengths alongside industry, but of course, if we arrived at a situation where they were head to head in competition with elements of industry, I think we would perhaps find that a slightly worrying situation.

Lord Howie of Troon

118. Why would it worry you? It is all supposed to be about competition, is it not?

(*Dr Jude*) Yes, my Lord, it is. Our industry uses ESA as a mechanism by which they build up their expertise, which they then go on to exploit in the worldwide commercial arena, and it would be rather difficult for the DRA to do that. That is why I believe it would be better to avoid those direct competitions, and for each side to bring its own strengths to bids. I think that would help industry in the commercial sense also.

Lord Craig of Radley

119. As your evidence brings out very clearly in the example of aero-engines and Rolls-Royce and DRA, there has been a longstanding, co-operative activity there. I do not know whether you could ever describe that though as competitive. It is collaborative rather than competitive. The thrust of much of what we have been hearing about the DRA has tended to point out that it is going to be competitive in the future rather than just collaborative, and it seems to me that there is a need to define very clearly in everybody's minds where collaboration ends and competition starts. I am not absolutely clear how you arrive at that, other than on a case by case basis.

(*Mr Foster*) It is very difficult. Clearly, the DRA is unique in terms of its skills and longer term strategic research. If it changed the nature of its business and went in for short-term consultancy work, that would be highly concerning, because it would cease to offer the range of long term research skills it is now doing, but fortunately there is no sign that that is what the DRA wants to do. It has a major customer, the MoD, which wants it to continue to carry out this longer term strategic research role. As we said before, we want to see the maximum spin-off from that activity, but an element of competition is clearly something which John Chisholm and the senior management there welcome. They can see it will keep them on their toes, and it is something which the DTI as a customer welcomes. This is a very difficult area. The question you are alluding to is: does one want to see head on competition between these very sensitive research organisations? That is an issue which the Government has been grappling with, and there are very difficult issues of critical mass in particular areas. Unless you have a certain size, it is hard to run an effective organisation. One is getting into quite difficult terrain here.

Chairman

120. You have given the European Space Agency as an example in paragraph 26, then you tell us it is a totally inappropriate example. Where else is it likely to arise if this is the wrong example?

(*Dr Jude*) My Lord, I think there could be examples in the European Commission's framework programme for research. I do not myself know of any examples where the DRA has won competitions there, but it is a possibility which I believe they are exploring.

Lord Redesdale

121. If the DRA were able to work marginally and, say, win contracts from both the DTI's own research establishments and industry, you said that you will be very concerned that that should not happen. Is that the sort of competition that you are worried about, where the DRA will be able to undercut other organisations?

(*Mr Foster*) Can I clarify what I was saying? An element of competition between the agencies for government departmental work is something in the broad which we do want to encourage, as it keeps the agencies on their toes. The very fact that the DRA might tender, for example, for part of the national measurement system is something which is probably, in the broad, helpful in terms of competition between organisations. The concern I expressed related to the scale of competition if there were actual risks to the current structure of agencies offering services, if they ceased to have critical mass.

(*Mr Downing*) From the Department's point of view, we welcome competition between agencies. It was one of the underlying reasons that the government research establishments were set up as agencies, so they could compete, and we could get fat out of the system if there was duplication of effort. So we are fully supportive of competition but, as far as our own agencies are concerned, we would be very worried if the competitive practice was seen to unfairly disadvantage our own agencies. On the question of marginal costing within the present rules on charging, there is an opportunity for marginal costing in exceptional circumstances as market leaders, but we have to understand that, if there is marginal costing for some, in the way the agencies work, that will mean there is a surcharge on others, and that is of course quite difficult if the services that

[Lord Redesdale *contd.*]

are being provided indeed are services for Government, where government departments find themselves paying over the odds because another part of the activity is being cross-subsidised. So, in general, we would not see cross-subsidisation as desirable. That said, I think there is one area in particular, which, again we have referred to before, where marginal costing is defensible, and that is in the area of under-utilised capital facilities. It is generally true to say that there are fairly high running costs associated with those facilities, whether they are being fully used or not, and if marginal costing is a way to increase usage, then I think that is something that seems reasonable, and in fact may secure the long-term existence of those facilities which we have already referred to.

Baroness Hilton of Eggardon

122. The opposite side of the coin is whether you feel they should be allowed to charge a levy on their contracts to fund research. We have heard that they are allowed to retain a proportion of their licensing fee. Do you think it would be appropriate for them to put a levy on contracts to retain it, and would you argue with the Treasury on their behalf?

(*Mr Downing*) You touch on a very thorny issue. It is true to say that the original guidelines outlining how the government research establishment agencies would operate within what is termed "the internal market", that is, where they compete together, certainly did anticipate that agencies would have the freedom to levy a surcharge on all work to provide something we call seedcorn funding, and the idea was that this seedcorn funding would be in the gift of the Chief Executive of those agencies, and he would be able to deploy it, to refresh and to enhance his skill base and develop new capabilities in anticipation of emerging markets and customer demands. Unlike DTI agencies, which adopted this practice from the first day and are free to levy surcharges up to 10 per cent on all the work they do, MoD and some other Departments have steadfastly resisted introducing that procedure. It is not for me to say why. It clearly is for MoD to explain. However, I think the failure of all Departments to act in the same way on this type of issue has let the level playing field become somewhat tilted, and I have to say to the commercial disadvantage of DTI agencies, and those agencies in other government departments that have accepted the levy principle. So, yes.

123. Was that a yes to the fact that you think it would be a good idea to pursue this?

(*Mr Downing*) I am sure, from the DTI point of view, we will be more than willing to enter into any discussions and into any representations that will level the playing field so that we really can have fair competition between these organisations.

Chairman

124. If there is to be a level playing field, you must make it quite clear whether you want everyone to have a surcharge or no-one to have a surcharge. Both ways would achieve the level playing field.

(*Mr Downing*) The departmental line is that everybody should have a surcharge, because we believe that Chief Executives within these agencies require that type of freedom to invest in the longer term development of the establishments and to balance the short-term pressures that necessarily occur when you go into a market trading situation.

Lord Howie of Troon

125. I would like to dwell very briefly on competition. I gather the impression that a somewhat ambiguous theory of competition has emerged in last quarter of an hour, and I have been wondering what would happen if the DRA were successful in competing with these other agencies to the extent perhaps of putting some of them out of business or causing them concern. Does this agreement which you have with the DRA permit you to stop it competing in that way?

(*Mr Downing*) We have no agreement with the DRA that prevents them behaving in that way.

126. So you could not stop them even if you wanted to?

(*Mr Downing*) I believe not. No, we could not. The market is free, and if we put out work for competitive tender, then the DRA is free to put in a competitive bid and we will have to judge that on the rules of competition.

Lord Craig of Radley

127. I would like to move on to your section on technology and spin-off, which I do not think makes much reference to electronics. I think everybody would agree we have a major international centre of excellence in this area at Malvern, even though the United Kingdom itself has no more than a modest electronics industry. I would welcome comments on whether the DTI would wish to see more spin-off from Malvern to United Kingdom companies in this field, and if so, how would you advise the DRA to set about achieving this?

(*Mr Foster*) As I mentioned earlier, we have been working with Malvern a great deal over the years. It is an extremely important centre. Obviously there have been some successes and some disappointments. There is absolutely top-class research, world-winning research, not being fully exploited in the United Kingdom. On the other hand, there are other areas where the DTI has been active, trying to work with Malvern. I mentioned, for example, computer security, where there is top-class work taking place both at Malvern and indeed at GCHQ, where the DTI recognised there was a need to make computer security skills available into, for example, the banking sectors, and hence thought it would make sense to work jointly with what was then RSRE, and an important initiative emerged. In addition to that, there are the various advanced technology programmes, the ATPs, to which I referred, in information engineering and gallium arsenide, and obviously many of the key skills for these have been based at Malvern, and industry has been very actively involved in that. Many companies like GEC have been involved in these programmes, and obviously we welcome the great enthusiasm at DRA and the spin-off. The key thing now is to make a success of these dual use technology centre

[Lord Craig of Radley *contd.*]

concepts. We have talked about the structural materials centre. That is getting going. What is vital is that the DRA and DTI agree on what are the key areas, and quite clearly there must be some, for example, in the software engineering sector, which is the growing part of electronics. There is a need for highly reliable software, and it would make sense to build on the enormous skills at Malvern. That is why we are putting emphasis on the idea of these centres being a success, being properly run and being properly funded, seeing spin-off from those, and having a series of programmes, some of which quite clearly ought to be centred at Malvern.

128. I share your concern and interest in information technology, but I am advised that DTI support for Malvern has fallen from £6.4 million in 1987-88 to £0.7 million in 1992-93 or 1991-92. Whichever it is, that seems to me a very significant fall. There is probably an obvious explanation, but it is not immediately clear to me.

(*Mr Foster*) I am sorry we have not got the exact figures here.

Chairman

129. I wonder if you could write to us with that information.

(*Mr Foster*) I have set out a very long list of collaborations in which it is currently involved. There are 23 which we are either funding or participating in. I am not saying that is an answer, but we will come back to you on that.[1]

Lord Craig of Radley

130. My experience is that it is probably now under another heading, and you are probably spending more rather than less. Perhaps I will ask our Secretary to give you chapter and verse on it.

(*Mr Foster*) I can assure you there is certainly no lack of interest in the work at Malvern; very much the reverse. There are 23 projects in which the DTI is very actively involved.

Lord Craig of Radley] It would be very nice to know that your interest is backed with hard cash.

Chairman

131. Mr Foster, I wonder whether, in the light of that, you could submit further written evidence, giving us perhaps back to 1987-88, the earliest figure on that table, perhaps going as far forward as today, to show what has been the spend on the old research establishments which now form the DRA.

(*Mr Foster*) We will do that.

Chairman] We have just about exhausted all the questions that we were proposing to put to you and our time has expired. Could I thank you very much for the patience with which you have answered a quite wide-ranging number of questions. Thank you for your help.

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[1] See below.

Letter from Mr. Foster to the Clerk of the Committee

DEFENCE RESEARCH AGENCY

Thank you for your letter of 28th January about DTI funding for information technology at Malvern.

RSRE Malvern used to be part of the Ministry of Technology. When it became a Ministry of Defence establishment it continued to carry out civil work which was directly funded by the DTI as successor to the Ministry of Technology. In the mid-80s, however, the DTI decided, as a matter of policy, that Malvern should cease to receive "block funding" but should instead be funded on a project basis. The block funding was tapered off as shown in the Table on page 7 of the POST Report[2] referred to in your letter.

Malvern has participated in 23 projects under DTI programmes: 12 under the Information Engineering Advanced Technology Programme (ATP); 1 under the General Industrial Collaborative Projects programme; 3 under LINK programmes; 5 under the Gallium Arsenide ATP; 1 under the Advanced Silicon ATP; and 1 under the SALT ATP. Of these projects, 9 are still in progress. However, the funding attracted to Malvern through its participation in these projects was, as it turned out, less than it had received in previous years from direct funding.

It is impossible to provide a complete explanation for this. There may well have been some institutional factors and these are set out in the POST Report. But in addition, it may be that the civil work programme at Malvern during the Ministry of Technology period was not sharply enough focused and needed to be subjected to the discipline of a project-based approach.

As the Sub-Committee will be aware, the DTI announced a further change of policy in May 1993. This included the substantial reduction of direct funding for industry-industry R&D collaboration, exceptions being in support of particular policy objectives including energy policy, aircraft and space technologies and SMEs under EUREKA. SMEs continued to be eligible for support under the SMART and SPUR schemes.

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[2] "*Relationships between Defence and Civil Science and Technology*", May 1991.

The balance of DTI funding has thus now shifted away from generating technology, as in the programmes mentioned above, and toward support for the promotion of innovation, spread of best practice and the use of technology.

I hope the Sub-Committee will find this explanation helpful.

Robert Foster

10 February 1994

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HOUSE OF LORDS SESSION 1993-94

MINUTES OF EVIDENCE
TAKEN BEFORE

THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

(SUB-COMMITTEE II DEFENCE RESEARCH AGENCY)

Thursday 3 February 1994

Professor A C Baynham

SMITH SYSTEM ENGINEERING LIMITED

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THURSDAY 3 FEBRUARY 1994

Present:

Chorley, L.	Redesdale, L.
Craig of Radley, L.	Selborne, E. (Chairman)
Hilton of Eggardon, B.	Dainton, L.
Howie of Troon, L.	

Memorandum by Professor A C Baynham, Principal, Royal Military College of Science, Shrivenham

Introductory Remarks

The following comments are made as Principal of the Royal Military College of Science, and as a previous Director of both the Royal Signals and Radar Establishment and the Royal Armament Research and Development Establishment. In my current capacity I see a fair amount of the DRA staff at all levels in both training and research contexts, but could, of course now be out of date on some aspects of the DRA.

Before launching on detailed responses to the questions posed concerning the Defence Research Agency some more general comments may be helpful.

I shall make five remarks which are intended to warn of dangers and not to demolish the concept of the DRA. In summary they are that:

(a) We must define the word research for it does not have its conventional meaning in the DRA.

(b) There is an inherent *efficiency* in a single, neutral research agency and we need to protect the DRA from the vested interest and short termism engendered by market forces.

(c) Definition of the programme must provide a stronger formal role for the technical support.

First remark—The nature of the role.

The DRA exists in order to support the military equipment procurement programme. This is composed of concept development and evaluation (CDE) by the DRA and equipment development by industry. The title Research is usually used to describe the exploration of the boundaries of knowledge and development of new understanding. The DRA does none of this. It does have a very small programme (about 6 per cent) of "blue sky" (BS) research, which explores technologies *which seem likely to be military interest.* The majority of their programme is in the research (CDE) category.

The equipment development programme is far more expensive than is the supporting research (CDE) programme and consequently mistakes made in equipment development dwarf the costs of the associated research (CDE). If, therefore, the efficiency of the *overall* equipment procurement programme is to be maximised, the supporting research (CDE) safety net is a vital element. The global procurement programme needs to be efficient and this is not necessarily achieved by separately addressing its constituent parts; research (CDE) and equipment development.

Second Remark—Experience in USA.

The *research* programme is the seed-corn for the future from which new ideas, new concepts and new possibilities arise. Without it the military force multiplication, which has so often been attributed to advanced weapon technology, becomes force division because our own equipments lag behind the capability and sophistication of our potential enemies.

It is interesting, for example, that, faced with the reduction in east west tension and consequent uncertainty over the nature of the threat, the Americans decided that their investment in *research* (CDE) should be protected whilst equipment programmes are pruned in order that they may have a rich spectrum of technical possibilities on which to draw when the new threat is defined.

It is also of interest to compare the record of achievement of defence in the UK with that in the USA. Inspite of a much smaller budget, the UK has kept pace technically in many areas with the US over many years and it has to be asked how this has been achieved.

In the US there are few, if any, Defence laboratories of the type to be found in the UK. Both the R&D programmes are largely carried out in industry with numbers of parallel contracts being placed with different firms. The solution to technical problems are, therefore, purchased many times over in the USA, which is hugely inefficient. Moreover, since each of those firms is likely to have developed a somewhat different solution, downstream difficulty is then encountered in establishing a competition for equipment production.

In contrast, in the UK, a small budget has necessiated early decisions between alternative competing technical solutions to problems. Once such solutions have been developed in the Defence establishments, they have been made widely available to industry who could then use them in meaningful equipment procurement competitions. This, after all is when the big expenditure occurs, and where effective comeptition is required.

Third Remark—Relationship to Industry.

It is important to recognise that because the DRA exists to support the equipment procurement programme;

(i) its first allegiance must be to MoD, thus any other business won must always take second place. Hardly a good marketing posture!

(ii) its neutral advice in procurement is vital and it cannot, therefore, indulge in equipment developmental or production activities. However, industrial competitors can subsidise their research from production, underbid the DRA and close down areas of its technical competence at will. At this stage PE becomes an unintelligent customer, unless a certain minimal amount of "hands on" work is retained within the DRA in all areas where expert purchasing might well be required.

(iii) it frequently requires access to unusual and, therefore, very expensive facilities. In consequence the DRA overhead rates will render it incapable of competing with industry, unless the costs of these facilities are "ring fenced" and placed outside general competitive costing exercises.

Finally, I have to emphasise that I am not aware of any organisation around the world which can survive solely on an income from research. Time scales to "pay off" are just too long, and the inevitable consequence is "short-termism".

Fourth Remark—the customer

The research (CDE) customer takes the form of a military officer, who is carrying out yet another of his two year postings. He has the advice of a senior longer serving scientist amongst his team of scientists, project managers, administration and more junior military officers.

I do not believe that this structure is sufficiently in touch with technical developments, or motivated to do anything more than shoot the crocodiles nearest the boat.

Fifth Remark—Staff

Having made the foregoing remarks concerning the nature of the DRA task, I turn finally to manpower and training issues. The constraints described above are clear to staff and will destroy morale so that the DRA will become progressively less able to attract the same calibre of scientist as in the past. Already staff complain of studies replacing hands on concept development and of short termism. Moreover, as Principal of RMCS, I can testify to a four-fold reduction in numbers of students attending this College from the DRA since 1989[1]. What has happened to training & development of staff for cutting edge technology development?

Quite simply the PE are, and must remain, totally dependent upon the DRA scientists to evaluate the technical capabilities of equipments offered by defence industry. They are in danger of finding that the DRA scientists no longer have the necessary in depth knowledge of defence technology to provide in depth critical comment.

Having made the foregoing remarks I emphasise that they are intended as warnings of danger rather than demolition of the DRA concept.

I turn now to answer some of your more specific questions.

1. THE DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH THE MOD

1.1 *How independent of the MoD is the DRA?*

The DRA is totally dependent on the MoD because the Research (CDE) budget dwarfs that available from elsewhere within the UK. Moreover, under its terms of reference the DRA must always give first priority to MoD business, thus other customers can only be treated as a fill-in/stop-gap/convenience source of income. It is almost a monopsony situation.

1.2 *Is the DRA's new status as a trading fund a help or hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

The trading fund is of major assistance in so far as it allows management freedom.

1.3 *How does the DRA's status affect its research strategy?*

It is a well proven fact of UK and overseas experience that market forces have driven research associations enexorably towards short term programmes of measurement and problem solving. Already it is noticeable that the DRA is unable to select and fund any long term work. Nor do I believe that this process will sustain a corpus of knowledge and expertise within the DRA in the longer term. The vast majority programmes are determined by the military customer and I have the most serious doubts about the ability of the average military officer on a merry-go-round of two year postings to choose wise and enlightened programmes. The exception is the minute strategic research programme (8 per cent of the portfolio) which is managed by scientists in association with the customer.

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[1] Attention is drawn to Professor Baynham's response to Question 170.

1.4 *How has the MoD's system of Research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading Fund Status?*

No answer

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

The new status forces DRA to be entirely responsive to MoD, with no scope for pro-activity. Other government departments and private industry will judge their relationship with the DRA on much more pragmatic grounds than the simple existence of a trading fund. Of particular concern to foreign governments will be the DRA's ability to handle the most sensitive information in their new capacity of arms length civil servants. This trust placed in Government scientists in the past, particulary by American peers, has been of immense benefit throughout NATO.

1.6 *Reformulation of the DRA strategy*

Whilst I cannot throw any light on the DRA's reformulation of strategy, I am strongly convinced that the issues mentioned in my opening remarks are of paramount importance to the future of the DRA. It is vital that the longer term and more speculative areas of work are protected, in order that our future more flexible defence posture can be supported with suitable technology.

1.7 *Non R&D activities of the DRA*

In times of tension and war the DRA have provided a service to Her Majesty's Forces, which, very often, could have been carried out by no-one else. By their very nature the Defence Research Establishments had access to information of an extremely sensitive nature and it was usually based upon such information that this special service was provided. The broad picture provided by such information cannot generally be made available to industry, only narrow snapshots.

Insofar as service to other government departments and private customers is concerned, it usually arises because of expertise and/or equipment held uniquely within the DRA, and I believe the continued provision of such service to be highly desirable for both the DRA and the nation.

2. The DRA's Management, Internal Affairs and Corporate Strategy

2.1 *Impact and restructuring of rationalisation*

In the longer term, restructuring and rationalisation should not effect excellence and quality, but it may help it to achieve its budgetary challenges.

2.2 *The pace of rationalisation*

The change is so radical that slow progress is desirable if the DRA is to avoid major errors.

2.3 *Recruitment*

It has always been the case that the most valuable staff have remained with the research establishments, inspite of salaries, because the programmes have been fascinating. Short termism would erode this attraction and the focus could, therefore, move towards salary once the recession is over. Given a competitive salary, the DRA should be able to attract and retain staff, but probably not the dedicated scientists of the past.

2.4 *The Pathfinder programme*

This programme existed in the research establishments under a different title before the launch of the DRA. It was effective in selected narrow areas where the cost of the technology was high and where the maturity of the programme was such that it had clear implications for future business but had not yet reached the stage of intercompany sensitivity over IPR. It will, therefore, be effective during a short period in the development of each technology. Industry and other collaborators will always be very cautious over the ownership of IPR on this programme.

2.5 *Identification of future needs*

DRA liaises closely with PE and the defence systems and defence policy staff and forms its own views of technical possibilities. However, DRA is entirely dependent upon its ability to convince a customer of a future need. It is unhealthy for the DRA to have no scope to pursue its own ideas.

3. THE DRA'S RELATIONSHIP WITH INDUSTRY, EUROPE AND THE WIDER WORLD

3.1 *Civilian spin-off*

Where this is technically possible it is extremely valuable but it is by no means as universally relevant as some would like to believe. The RSRE at Malvern was always cited as an example of what was possible. However, it had the advantage of pursuing a technology (electronics) which was undergoing exceptionally rapid growth and demand at the same time in the civil sector. There was, therefore, a hunger for this technology. Very few households require the technologies to be found in a tank. I believe the DRA should be asked to seek civilian spin-off insofar as it does not jeopardise the primary defence role of the allocated funds, or joint funding compensates (see later).

3.2 *Conditions for technology transfer*

This is a problem of innovative application of defence technology to civil projects. Studies have been carried out of the conditions necessary for successful innovation. These demonstrate that innovation occurs when a technology rich environment comes into contact with a problem rich environment, ie a technical expert who is ignorant of application problems meets a practitioner with problems but no knowledge of technology. In answer to this question, therefore, an appropriate technology must be brought alongside a need. This requires knowledge and enthusiasm, not more management, and is extremely difficult as DTE demonstrated.

3.4 *DRA involvement in the DTI link scheme*

Comments made under paragraphs 3.1 and 3.2 are relevant. Jointly funded programmes should be pursued more vigorously in appropriate technology areas.

3.5 *DRA in place of the DTE?*

See 3.2 and 3.1.

Stimulated by the many successful civil spin-offs from research establishments the DTE was launched on the assumption that there were vast numbers of other inventions of relevance to the civil sector lying dormant within the defence establishments. In fact the obvious spin-offs had already been exploited and I suspect this is largely still true.

3.6 *Conversion and diversification of defence industry*

DRA seems ill-qualified for such a task.

3.7 *Non-defence industry and dual-use research*

There are many fundamental differences between defence and civil sectors. Notable amongst these is the fact that the civil sector often achieves the benefits of scale, the military sector requires technology at the cutting edge. There is, therefore, a natural opportunity for technology to flow from defence to the civil sector for exploitation, and then for the benefits of scale to be made available within the defence sector.

I believe such partnerships would benefit both parties. Dual use research is certainly worthy of examination, but it is important to avoid achieving "the worst of both worlds".

In the present climate of reducing defence expenditure, MoD should launch a cost reduction programme in which they seek to "ride on the back" of volume production in the civil sector, and allow the civil sector absorb defence technology.

3.8 *Competition with industry*

See my opening comments.

3.9 and 3.10 —*No comment.*

3.11 *Lessons from other countries*

See my opening comments.

A. C. Baynham—Professor

6 January 1994

Examination of Witness

PROFESSOR A C BAYNHAM, Principal, Royal Military College of Science, Shrivenham, called in and examined.

Chairman

132. Good morning, Professor Baynham. We are most grateful to you for coming to help us today. Would you like, first of all, by way of introduction to explain your experience in the matter concerning the Defence Research Agency?

(*Professor Baynham*) Yes, your Lordship. I have spent most of my working life in what is now the Defence Research Agency. After graduating I worked at Malvern, starting fairly near the bottom of that establishment, and finally became Director there. I subsequently was Director at the Royal Armaments Research and Defence Establishment at Fort Halstead, though that included work at Chertsey, Kirkcudbright and various other sites. I worked in the main building, so I have seen the politics of MoD in operation as well.

133. Thank you very much. You have referred in your written evidence, which we found most helpful, to the success that the United Kingdom has with its relatively modest resources compared to the United States, and I think we would acknowledge that your pride as a participant in that is well justified. Would you like to tell us what you think that is due to? How did we achieve this considerable success over the years?

A. I think my thesis is that the structure which we have used to conduct our defence research, together with the need to make early decisions on rival technologies, is very important. In the United States there are very few establishments like the Research Establishments in this country. They tend to place contracts for research out in industry and, therefore, place many research contracts to solve the same problem. The result of that is that they buy the solution many times over. They get a number of rival solutions and, then, of course, there is difficulty in conducting a competition between the firms which have generated those solutions. By contrast, in this country because of the shortage of funds we have to make early decisions on the competing technologies and tend to have proved that that can be done fairly effectively. The chosen technology is then researched in the Research Establishments (as they were) and then made available to industry on an even-handed basis so that all sectors of industry can compete on a level playing-field. That, it seems to me, is a much more efficient way of operating because, first of all, you only buy the research once, and secondly, you have an even playing-field for subsequent competition for the equipment procurement which, after all, is the expensive part of the activity.

134. But is there a danger you perceive with the new arrangements, particularly with the Trading Fund and the interfaces between MoD and DRA, which have to be created? Do you feel that this puts that system in jeopardy?

A. I think the danger of the Trading Fund is that it would engender short-termism. I think the Trading Fund could certainly root out inefficiencies, and it is undeniable that there were inefficiencies within the old structure. I think the difficulty is that the customer, faced with annual accounting, faced with immediate needs which are already greater than his budget, is likely to prefer the short term to the long term.

135. But that is in a way a commentary on the efficiency of the customer in identifying the needs, is it not?

A. I think it is also a commentary on the identity of the customer. If you look at the customer, particularly for the applied research, you find that he is predominantly military. There is certainly some science support but he is predominantly military. The military officers are people who are passing through their posts on postings of something like a two-year duration. They have been doing very different things before and will be doing very different things afterwards and yet somehow they have to make their mark. They have to show some evidence of achievement during those two years for career reasons, and must therefore favour short-term achievements.

Lord Chorley

136. But what happened before the DRA? Surely this has always been the case, that soldiers or officers come in for a couple of years and then go out again?

A. That is right.

137. What is so very different now from before?

A. I think the difference is that decision making was at the opposite extreme before. The scientists had too much power. I think the pendulum has now swung to a situation where we have too much power with the military leg of the activity.

138. I wonder why you do not have an arrangement where the pendulum is in the middle, if that is the case?

A. I think one of the things I would raise is the possibility of having peer review on the applied research programme, as there is currently on the basic research programme. The basic research programme has people from university and other organisations who provide advice on the programmes that ought to be backed. I would have thought that an input of that nature into the applied research programme would be wholly advantageous.

Lord Dainton

139. A moment ago you were suggesting that short-termism would squeeze out important, what you call in your paper, I think, basic research?

A. Yes.

140. Is it not, however, the case, that the customer for that work, which is the Ministry of Defence, has a defence research adviser or whatever charged specifically to ensure that that does not happen?

A. The Chief Scientific Adviser, yes; he is certainly charged with that responsibility. I think the difficulty is that that is a very senior appointment and what is worrying me is a day-to-day, year-on-year creep which will take place at a much lower level.

[Lord Dainton *contd.*]

141. But it should be the responsibility of him and his Defence Research Advisory Committee to keep an eye on this, should it not?
A. Yes.

142. So that problem which you have raised ought to be addressed by them?
A. I am clear that that is exactly what they do and they do address exactly that point. I think particularly in the applied research area, because it is a portfolio of disparate activities, there will be a slide from the development of technologies which are required for systems in the future towards the solution of short-term problems and it will be very difficult actually to trace that slide.

Lord Craig of Radley

143. There are various ways that basic research, as we have understood it from DCSA and DTI, is funded. DTI said they provide enabling funds rather than being active as a customer. So it seems to me that there is a certain proportion—how you measure the proportion, whether in terms of finance or in terms of staff or whatever—there are various measures there of resources put into this side. I share your interest that there is basic fundamental research going on as well as the applied. But would you not agree that the applied work, in order to solve Ministry of Defence requirements, is a very major part of the DRA's role? You cannot deny them that?
A. No, I would wholly support that, that the DRA are there to support the Ministry of Defence, undeniably. I think the difficulty is that the DRA is now very much the creature that MoD make it and what concerns me is who will be putting on the shelf the seed corn for the future. There is some very interesting work which has been done on innovation. Research has been conducted by the Harvard Business School on what it is that produces innovation. You might remember that there has been argument in the past between technology push and market pull and there were two schools of thought. Some thought the one was more important, some thought the other was more important. The result of this research by a man called Voss is that he has shown that you really only get innovation when a technology meets a problem, which is blindingly obvious when you say it like that. I am concerned that we should retain some sort of balance between those who have problems and rightly the funds, as was just being said, and those who know the technology and can see the long-term possibilities. I think it is a balance between those two which will produce the capabilities for the future in the long term.

Lord Chorley

144. In your first page, and we have been really almost touching on this, you say in your three-part summary under (b), "There is an inherent efficiency in a single, neutral research agency and we need to protect the DRA from the vested interest and short-termism engendered by market forces." We have touched on short-termism and no doubt we will come back to it, but could you elaborate on the vested interest and how one might protect the DRA?
A. It seems to me that in making the DRA compete with industry one is trying—

145. The CDE work, do you mean?
A. Yes. One is placing them in a position where they are going to find it very difficult to be both the neutral observers and advisers to MoD and at the same time to be able to participate in a competition with industry. Now, I know we say a lot about Chinese walls and so on and certainly when I was director of RARDE I had some experience of Chinese walls. It is actually very difficult not to achieve a Chinese wall, but to do it convincingly.

146. How would you deal with this inherent problem that you have found?
A. I think there is a difficulty in allowing the DRA to compete with industry at all.

147. But does that not then carry with it the problem of inefficiency, complacency, of overheads creeping up, lots of other things, a monopoly situation?
A. I think it undoubtedly does. I am sure however that one could define benchmarks which one could use to compare the performance of the DRA with industry and force the DRA to operate to similar levels of efficiency to those of industry.

148. Although they are doing two very different things, from what you have said.
A. Well, there are research labs in industry where they do certainly more short-term work, but there are research labs in industry where comparisons could be made.

Lord Howie of Troon

149. Professor, from your remarks so far and especially your answer to the last question and from my reading of your submission, I get the notion that you do not think this privatisation is a good idea. Am I right?
A. I did not think it was privatisation actually.

150. Well, whatever it is. It is a sort of semi-privatisation with a very distinct shareholder.
A. No, I would not go that far. I think that we should force the DRA to behave commercially. I think that some of the things or many of the things that have been done so far have been excellent. They have certainly faced problems which have grown over the years and improved their efficiency. I have no difficulty with that at all. I think all I am trying to do is sound some warnings, one of which is that I think a natural consequence of the current operation will be a slow trend towards short-termism and another of which I think will be on-going difficulties in the interface with industry because the DRA is trying to be too many things at the same time. But I am certainly not saying that I would like to turn the clock back.
Lord Howie of Troon] Just a wee bit?

Lord Dainton

151. I find this curious, my Lord Chairman. The arguments I am getting from you seem to me to point to the fact you feel that there is fundamental incompatibility between being the neutral adviser to

[Lord Dainton *contd.*]

the Ministry of Defence on matters and being in the market place. That is right, is it not?
A. Yes, there is a difficulty there.

152. So what is the solution? Do you separate these functions?
A. I was proposing that the DRA could be benchmarked in order to measure its financial efficiency and to be compared with other operations either out in industry or perhaps even in other countries.

Lord Chorley

153. One form of benchmarking is market testing.
A. Yes.

154. Which actually does mean competing.
A. Yes, it does. I have some difficulty with that because it asks the DRA to be all things to all men.

Lord Dainton

155. And yet curiously enough if it is going to compete in the open market, it also has got to have research to back that up and make it effective.
A. Well, I think you lead me there on to another point. The DRA has no facilities, as far as I know, to generate its own research.

156. Does it all have to be approved?
A. As I understand it, it all has to have some customer to pay for it. I may be wrong. I did say in my evidence that I have been out of the DRA for some time.

157. That might be a notional customer within the Department, might it?
A. I do not know the answer to these questions.

Chairman

158. Well, I think the evidence we have had from the Ministry of Defence does suggest that there has to be a programme agreed. They have no free money effectively.
A. Can I comment on that, my Lord Chairman? Any organisation needs to be planning for its own future and, as I said in my evidence, because the DRA has no capacity, no financial capacity to launch programmes which in its technical wisdom it thinks will be important in the future, it does not have that degree of freedom. It is simply doing what the MoD asks it to do. Now, it seems to me that in the long term that could well lead to an organisation which has not exercised the technical foresight to generate the capabilities which one day we shall suddenly discover we need from it.

Lord Dainton

159. But may I ask, does it have the right to put in information and knowledge to that prior stage where those forms are being determined?
A. Certainly the dialogue with MoD is strong and to the extent that they can persuade the customer then that is a degree of freedom which is certainly open to them.

Lord Craig of Radley

160. We are also led to believe from the evidence given to us by the DTI, which was mentioned a moment ago, that they provide what they call enabling funds directed to "blue sky" research for which there is not an obvious customer. Indeed they do not call themselves the customer for this activity. Do you not feel that that in part at least meets the issue that you have been concerned about?
A. Well, first of all I am out of date on the funds, but I think it would be useful if you could look at the size of the DTI funding in that area and my belief is that it is very small compared with the MoD's own strategic research programme which itself is only about 6 per cent of the total activity. So yes, it is there, it is altogether helpful and good that it is there, but I think it is a very small activity.

161. But would you not agree that at that stage of blue sky research large sums of money are not necessarily the criterion by which you would want to judge?
A. No, I think that is a fair comment. Can I just expand a little bit on this point? The evidence is that the size of the strategic research programme, the blue skies work, has really not changed very much over the years. It is the phase beyond that, what I called CDE, which worries me. At the end of a blue skies project something is discovered. Let us say, for example, it was the laser some years ago discovered, and certainly I was involved in the early days of laser and we used to call it a solution looking for a problem. It was clear there was some military significance, some possibility here. There were so many analogies with the microwave sources for radars but we could not see what to do with the laser. There was a long phase after that, after the physics of the laser had been demonstrated, which comes into CDE in my definition or the DCDS programme, where lasers were developed and concepts were sought, ideas were tossed around about how one might use this newfangled capability in a military context. It seems to me when the blue skies work has been done, DCDS is faced with a new device. There is the new device and no-one quite knows how to use this device. But if at the other end of the spectrum of his portfolio there is a desperate need to develop a slightly longer-range gun or a guided weapon with a better armour penetration, he is going to go for that very specific requirement because it is today's problem rather than the speculative end of his portfolio. So my worry is not specifically the blue skies strategic research, it is the early days of a new technology in the DCDS portfolio where I think that short-termism is going to start to exercise a lot of pressure.

Lord Howie of Troon

162. Professor, if I understand your thesis correctly, the blue skies area is a very small area?
A. It is.

163. You suggest it is 6 per cent.?
A. I think that is right.

[Lord Howie of Troon *contd.*]

164. So you are quite substantially worried about 94 per cent of the work of the DRA? That is virtually all of it?

A. No, the rest of the work of the DRA actually is funded by two other customers. I have lumped it all together as CDE but it is actually funded by DCDS and also the staff of the Chief of Defence Procurement, the people who are actually procuring the equipment. Something like 30 per cent of that remaining 95 per cent is in the area of equipment procurement, so let us say that leaves 60 per cent of the programme as part of DCDS's portfolio.

165. That is the bit that worries you?

A. That is the area where I am worried. But what I am talking about is not even the whole of that programme. Most of it I have no quarrel with. I am saying in that area, which, as you pointed out, is a major part of the total activity, I fear a long-term slide towards a short-term activity.

Lord Craig of Radley

166. Professor, you may remember we asked a question about DRA's new status with the MoD and how that would impact on other government departments and on private industry. In your reply you picked up a particular point which I would like to focus in on. That was your concern that there were going to be foreign governments, maybe, indeed, foreign firms, which were not clear about the DRA's new status and, therefore, rather dubious about doing work with them. Your actual comments were, no doubt because of space, fairly broad-brush. Have you any specific examples or more you could say about that particular issue?

A. Yes. My Lords, I spent quite a lot of my time when I was in the Ministry of Defence involved in a thing called the Tripartite Technical Collaboration Panel, which was a forum in which information was exchanged between the United States, ourselves, Canada and Australia, and that was a very, very profitable exercise for all parties. On many occasions I witnessed the sensitivity of the other governments if you tried to bring in a contractor, a member, let us say, of British industry who had been doing work for the MoD under contract. They were not prepared to accept the interests of industry around what was basically a technical exchange table. The concern that I was expressing was lest, as the members of the DRA are moved to arm's-length from MoD, they begin to look more like members of industry than the civil servants which they currently still are defined as being. So that was the source of my concern and, of course, that becomes a much more serious concern as you get to progressively more highly classified programmes. With very highly classified programmes I could imagine, going back to my days in the past, there would have been some significant concern that the information being handed over was being handed to people who were *bona fide* members of the heart of the technical element of the Ministry of Defence.

Lord Dainton

167. If I could follow this up, it does seem to me that there is an illogical problem here. You said earlier that in the United States of America this kind of research is, as it were, contracted out to firms?

A. Yes.

168. Were you not concerned on the British side that information which was put before this tripartite, or quadripartite, group would find its way into American firms from our side, as it were?

A. Yes, my Lord, and indeed the members of the American industry did not come to those meetings and we usually put appropriate caveats on the information.

169. Could not that be done this way round?

A. My problem is in terms of who goes to the meetings. I think you have to have someone who is technically aware to exchange the information at the level I am talking about. The members of the DOD and DARPA, for example, in America were sufficiently technically competent (they were scientists by background) to understand the information that was being exchanged. What I am saying is that if we get to a situation where the DRA, which is, after all, the MoD's primary technical arm, is regarded as being outside the pale, then we could have some difficulty in providing technically qualified and acceptable delegates to such meetings.

Baroness Hilton of Eggardon

170. In your fifth remark, which is on staff, you talk about training and the shortfall in the students coming to you now. We wondered what sort of courses they attended: are they scientific or technical? And do you think it is possible that they are going to other universities to make up the shortfall or is it a complete loss due to budgetary constraints?

A. First of all, I did actually have some more analysis done on that—I was warned that this might come up—and the reduction is nearer 25 per cent than a factor of 4, so I apologise for that but it did not come out until I did the analysis. Nevertheless, I would say a 25 per cent reduction is really a very significant reduction and I actually have here a list of the courses they came on in 1989-90, 1990-91, 1991-92 and 1992-93, which I can leave with the Clerk, but for the sake of answering the question they are very military courses, things like chemical hardening, in other words, hardening of equipment against a chemical and biological attack, ballistics, of gunnery and things like that, guided weapons technology, defence electro-optics, defence radar, laser safety, military communications, military electronic warfare, nuclear hardening, and I can go on down the list. They are fairly specifically military courses and many of these would actually have classified elements within them because in my current role we still have access to DRA technology in order to teach it to the defence customers.

171. So on the whole they would relate to the short-term immediate military problems that most of their work is concerned with rather than the sort of more abstract research?

[Baroness Hilton of Eggardon *contd.*]

A. That is right. The sort of things are, say, if a scientist was moving into the development of a new piece of equipment and knew nothing about chemical or nuclear hardening, it might be wise for him to go on this course so that he quickly gets up to speed. He will have to build on that knowledge, building on his scientific expertise and so on, but it gives him a start in getting up to speed with what is known and what he ought to be aware of in developing that equipment.

172. Is it your opinion that these budget constraints will reduce the number of students in developing equipments?

A. I am not well placed to answer that question. What I would say is that I think the DRA have been very preoccupied understandably in the last two or three years and my first assumption would be that they have actually been doing other, probably more important, things, but it is not a trend that I think they ought to allow to continue.

Lord Craig of Radley

173. That 25 per cent figure, how does that relate to the total student population at the college?

A. It is not a huge fraction of the population of the college.

174. But has the population of the college itself also reduced over a comparable period? What I am looking for is whether there is an overall reduction. Clearly there has been a defence budget reduction, a reduction in the size of the armed forces and a reduction in the size of the DRA, and it does not seem to me too surprising that there should be some reduction in the number of scientists you are dealing with or having as students.

A. Perhaps I can give two answers to that question. We measure the amount of teaching we do in terms of student days because some courses are longer than others. The number of student days has remained substantially constant over the period and the second part of the answer to the question is, as you will recall, my Lord Chairman, we have a contract to teach with the Ministry of Defence and the size of that contract in terms again of student load is largely unchanged over that period. It sagged slightly, but not by 25 per cent.

Lord Dainton

175. I am still quite puzzled in a sense and particularly with the submission which you make somewhere to the effect that it is very difficult now for the DRA to operate alone, to be in trading and generate enough money in order to support its basic research. That is the point I think you make early on.

A. My concern is that I do not believe the DRA have the freedom to conduct their own programmes. They need a customer for all that they do. I think any organisation which cannot plan its future and shape itself for the future is on a hiding to nothing.

176. But it comes back to this original question again, does it not, of the role of the DCSA? Is it not his job to be your advocate in the Ministry of Defence?

A. The role of the DCSA is particularly to look after the strategic research programme and, as I was saying earlier, that has really not substantially changed. If you like, DCSA has been fairly effective in protecting the longest-term programme. It is the long-term element of the DCDS programme where the ideas of military significance are developed and matured that is concerning me.

Chairman

177. Do you think there is a case for the DCSA widening his remit to take on more of the concept development and evaluation in order to see it through? You are clearly worried about this interface. Is the answer, instead of having short-term appointments from the service, to have greater powers within the DCSA's office?

A. My Lord Chairman, I would certainly welcome that. I think that could go a long way to solve the problem. What I was suggesting earlier was that within the DCDS we copied what has happened in the DCSA area. The DCSA has independent experts in to comment on his programme each year when he reviews it. These are technical experts and I am just suggesting that an alternative might be for the DCDS organisation to have independent technical experts in to comment on his programme in an analogous way, but I am equally happy with the proposal that you have made, my Lord Chairman.

Chairman] Well, I was not so much making a proposal as trying a hypothesis.

Lord Dainton

178. I am left in my mind with the feeling that Professor Baynham is somehow guiding us to feel there is some ideal balance which does not vary over time between basic strategic development on the one hand and the very short-term work on the other, but in practice is it not the case, and certainly it has been in my lifetime's experience, that this has to vary over time so snapshots are not really much of a guide as to what is happening and you have to look at a time series. Would that be correct?

A. I absolutely accept that, my Lord Chairman, but I think you can bounce a ball on a hill and it might bounce up sometimes and down other times, but most of the time on a hill it goes downhill.

179. You are saying the oscillations are taking you down?

A. I am saying that with the particular system we have put together there is a danger that the oscillations will take us downhill and not uphill.

Lord Chorley

180. At this stage it is a theory. Is there any evidence of this happening so far?

Lord Dainton] And before you answer can you tell us if it did not do it under the older arrangements?

A. I think, my Lord Chairman, certainly in the time that I was director of each of the establishments I was director of, the programmes did not noticeably change in that way. I have forgotten the second part of the question.

[Lord Chorley *contd.*]

181. Are they changing now or is this a theoretical imperfection you see or is it something which is actually happening? Should one give it a run for a few years to see how it works out?

A. I think by definition if long-term work is beginning to fall off, it probably will take a little longer than the DRA has had for it to be visible. This particular Committee is sitting at this point in time and I am voicing a concern about what I think could happen given the constraints. I do not see that it is a surprising concern given the way we have put this system together.

Lord Howie of Troon

182. To go back for a second very briefly to the ball on the hill, does it not depend to some extent on how hard you throw the ball and the steepness of the hill?

A. I think if you leave it to bounce it will go downhill in the end.

Lord Howie of Troon] It will go down eventually of course.

Lord Dainton] This is rather becoming a problem in basic dynamics, is it not!

Lord Redesdale

183. You noted on page 3, or you gave the impression, that industry could cross-subsidise bids for research contracts and so undercut the DRA and that this might close down expensive facilities. Do you see that as a particular risk to the DRA?

A. I thought I said "capabilities" rather than "facilities".

184. Yes, capabilities.

A. Any firm has to develop new products. Usually they have to do that at their own expense. If they can get even as a loss-leader some input from, let us say, the DRA to help them and give them an edge in their competition with all the other manufacturers then they have clearly helped themselves, so I do not say that I can see major facilities which are going to close because of this, but I do think that there will be a temptation or that industry could find it advantageous to offer cut-price work to MoD in order to get an inside track for the forthcoming competition for a procurement programme. As I did say in my evidence, the big money is in the procurement and it is not in the R&D.

Lord Dainton

185. At question 8 it says, "You note on p. 3 that industry can cross-subsidise bids for research contracts and so undercut DRA", a point which you have just covered. Was this in part based on the assumption stated in your paper that no organisation can survive solely on research income because I was rather struck by the fact that in my experience, and I was many years ago Arthur D. Little Professor at MIT, there are firms like Little, Stanford Research Institute, Battelle, which do survive. So what makes the DRA different in this respect from those names which are known around the world?

A. I did actually look into this some long time ago, and I understood that all of the examples which you quote actually did get government subsidy.

Lord Chorley] Well, they get government contracts.

186. They get contracts, but I do not know whether they get a subsidy.

A. I understood that they got government subsidy.

Lord Dainton] I am grateful to the United States for supporting me!

Chairman

187. Professor Baynham, is there a last word you wish to add?

A. No, your Lordship. I am very grateful for the opportunity to appear. I would just emphasise that I am not trying to demolish the DRA. It is really just the slope of the hill that worries me and I think if we are alert to those things and perhaps can do something to make sure the hill is a bit flatter, then I am entirely content.

Chairman] We are most grateful to you for seeing us today and for your help. Thank you very much.

Memorandum by Smith System Engineering Limited

CONTEXT

This evidence is submitted by Smith System Engineering Ltd. Its independence, technical skills and security status allow Smith to provide MoD and other customers with impartial advice on the exploitation of science and technology. This role is unusual in UK industry and is a similar service to that provided by DRA.

Our evidence reflects our perception that the primary role of the DRA is to assist MoD in being an intelligent or, in some cases, an expert customer for advanced technology equipments. Research by the DRA should be aimed at supporting this role both in the short and longer term through attracting high calibre staff to the DRA and allowing them to remain abreast of the state of the art in critical areas of technology. Direct output from the DRA element of the defence research programme should be seen as an additional benefit rather than the fundamental justification. Similarly, the pursuit of broader returns from technology transfer should not be allowed to compromise the primary role of DRA.

DRA in the service of MoD (addresses questions 1 and 3)

The key issue is the extent to which DRA must compete for its business. Competition with industry can occur at two levels: primary competition for research packages and secondary competition to carry out research within a primary package. Both could threaten the relationship between DRA and industry to the detriment of MoD and the national defence interest.

DRA brings together its own impartiality, experience of defence customers' requirements and specialist defence technology with the more general capabilities available in industry. This leads to excellent defence research and ensures that DRA has the staff and the knowledge needed to provide MoD with good procurement advice. DRA must ensure that its staff feel secure in collaborating with industry in order to offer MoD good value for money and to allow industry to benefit from the strong relationship with DRA which ensures free information exchange and access to technology. It follows that anything that damages that relationship of trust could be bad for MoD, industry and, of course, DRA itself.

Over the last few years we have seen the DRA-industry relationship weaken considerably and then, as the threat of more crude competition receded, strengthen again. DRA staff were at first naturally cautious about sharing information and letting extra-mural contracts to companies that they felt were in the process of bidding to take away their jobs.

There are many areas of defence research that might be better conducted within industry and there is pressure to establish the cost-effectiveness of DRA by "market testing". Competitive procurement in these circumstances must be handled with considerable care, not only because it threatens the delicate relationships between DRA and industry but also because it is unlikely to be a true indicator of DRA's cost-effectiveness. It is notoriously difficult to judge the quality of research work, even in retrospect, and industry's prices may reflect a willingness to subsidise research in order to capture the subsequent supply market.

DRA will best serve MoD by being free to work closely with everyone in the defence world without the threat of unfair competition from those with whom it should collaborate.

DRA in the broader national interest (addresses questions 2 and 3)

It is assumed that defence research could be of broader value by a process of spin-off, whereby technology developed for defence purposes can be transformed for civil applications. This was the premise on which Defence Technology Enterprises was founded and which drives most perceptions of technology transfer.

The reality has been that this form of technology transfer has been largely ineffective, not only from UK defence research but also from defence research in the USA and from other high technology ventures such as space programmes. It fails in three distinct ways:

- the specific technology is frequently too specialised for a new application, even though the underlying understanding and concepts would be of value;
- this underlying understanding is not transferred because the staff who developed the technology have no involvement in the civil application;
- the thrust of the transfer is that of a solution looking for a problem.

An analysis published by the US Department of Commerce in 1989 entitled "An exploration of the benefits of NASA spin-off" concluded:

> *Technology transfer is most often successful in a problem-solving context. When an organisation or person sets out to identify potential solutions to a real problem, there is a stronger likelihood that they will be open to a variety of suggestions than if a particular technology is pressed on a potential recipient who has no specific problem at hand.*

This suggests a model for DRA to maximise its value to the nation and to MoD by seeking to align defence research with other industrial research needs. Common research programmes to find solutions to generic problems which may then be tailored to specific defence and civil applications are more likely to achieve synergy than defence research which is retrospectively offered to other users. This approach underlies the positive steps towards the establishment of Dual Use Technology Centres and might lead towards DRA more closely resembling the US Advanced Projects Research Agency (ARPA).

Pathfinder could also be an effective way of aligning military and civil needs, but it should not be allowed to weaken the customer/contractor principle that MoD wishes to strengthen. Pathfinder projects should be those for which there is a clearly stated military need and a parallel civil interest and not just a way of directing MoD research towards work that industry needs for its military products.

Examination of Witnesses

Dr D R Wilkinson, Managing Director, and Dr C Elliott, Director, Smith System Engineering Ltd, called in and examined.

Chairman

188. Dr Wilkinson and Dr Elliott, we are grateful to you for joining us today. Would you like, first of all, to say a word about your company? You have in fact sent us a very helpful note and brochure but perhaps you might like to add something to that?

(*Dr Wilkinson*) Thank you, my Lord Chairman. May I say before you start that I will lead on questions concerned with the DRA and its relationship with MoD and my colleague, Chris Elliott, will lead on questions concerning technology transfer into the civil arena and related issues. We are Smith System Engineering and for anyone who does not know, we are not to be confused with Smiths Industries. We are a totally independent firm and our business is selling impartial advice on the use of science and technology. As far as we know, we are the largest independent company in Europe which is carrying out that function. We have 130 staff altogether, of whom some 80 are research scientists and technologists. Our turnover is roundabout £10 million and that is made up of roundabout 50 per cent for MoD and 50 per cent for other customers. We have a strong position with regard to national security, which means we have access to more information than some other contractors do. Within MoD we work widely throughout all aspects of the procurement process. We work for the DRA, helping them carry out research; we work for MoD-PE on the actual procurement of equipment itself, for the Chief Scientist's organisation and, indeed, for the systems organisation, or the OR staffs as they are sometimes called. So I think we have quite a good perspective on the overall defence procurement business.

189. That tells us something about your links with the MoD. Do you have any links, either formal or informal, with the DRA?

(*Dr Wilkinson*) Yes, we do. They are one of our major customers.

190. And when you refer to the 50 per cent MoD, does that include links with DRA because, after all, DRA is a wholly-owned subsidiary?

(*Dr Wilkinson*) Yes. Roughly a third of our MoD work is for the DRA, so a third of 50 per cent, roundabout 16 per cent of our total business,is for the DRA.

191. Could you give us some feel for the breadth of work you might be involved in, both for the MoD and the DRA?

(*Dr Wilkinson*) We are concerned basically with advanced technology in the communications and information systems and sensors areas and with the mathematical modelling of systems as a whole and the prediction of how an overall system is likely to fare in combat.

(*Dr Elliott*) Could I add a little to that. Taking the other cut through the problem, how far we go, our involvement goes from very early, indeed basic, research to what the previous speaker was talking about, the CDE stage, right through to helping judge tenders, actually deciding which offer of supply is more appropriate and, indeed, helping to monitor the supply afterwards. It is analogous to the classic role of a consulting civil engineer, though we do it with information technologies.

192. Does the new Trading Fund status for the DRA confuse or clarify the role you might have with the DRA? I can see that in some cases you might see yourselves in direct competition, in other cases you might see the DRA as effectively your customer?

(*Dr Wilkinson*) In practice the introduction of the Trading Fund has made little difference to us. We still successfully win contracts from the DRA and from MoD, just as we did before the introduction of the Trading Fund. So I think from our perspective as a contractor the answer to your question is not much difference. I think there may be other differences you may want to come on to in how it affects their relationship with MoD, but it is not a problem as far as we are concerned.

(*Dr Elliott*) Again can I enlarge on that? It is not so much the Trading Fund *per se* that is the issue, it is the spirit behind it. It is the relationship between MoD and DRA which has at present manifested itself as the Trading Fund which is the issue. The Trading Fund seems to us a second order point. It is whether the MoD chooses to give its work to DRA non-competitively. It is how it affects its relationship with its customers which is the important issue, not what its legal status is.

193. Are you suggesting, therefore, that the MoD has a danger of giving priority to the DRA?

(*Dr Wilkinson*) No, I do not think that is our worry. I think our worry is that the DRA must be in a privileged position in its work with the MoD in order to carry out its function, which we can explain in more detail, and if that privileged position is challenged by MoD it actually sets up insecurities in the DRA which result in the overall performance of the machine being downgraded.

Lord Dainton

194. Is not that kind of situation inevitable if the DRA is designated as the private confidential adviser to the Ministry of Defence and yet at the same time out in the marketplace?

(*Dr Wilkinson*) I agree with that.

195. So there is really a fundamental problem there, as the previous speaker was mentioning?

(*Dr Wilkinson*) Yes. We would argue that the DRA should be a private and confidential adviser to the MoD as its first priority and it should not be out in the marketplace.

Lord Craig of Radley

196. But it has been traditional even in the old Research Establishments to put some work extramurally, in other words, to you?

(*Dr Wilkinson*) Yes.

197. And that is going to continue, in effect? I would like to explore your problem here a bit more. Why has the introduction of the DRA actually

[Lord Craig of Radley *contd.*]

changed the situation to make you feel there is a genuine difficulty?

(*Dr Wilkinson*) I think the issue is the extent to which the DRA is expected to compete with industry in winning its work. Some time ago there was discussion on the concept of primary competition where the DRA would actually have to bid to MoD for its major research packages, and the net result of that was that the DRA staff were worried that industry was going to bid for these research packages and thereby essentially put them out of a job. The result was that the DRA clammed up in its dealings with industry. They were not as co-operative as they had traditionally been and that is wholly bad because it meant that the MoD was not now benefiting from the enormous wealth of experience in industry which normally flows into the DRA through those good relationships and industry was not benefiting from the extent to which good ideas in the DRA flow unhindered into the commercial area. In fact the threat of primary competition, our perspective is that has rather gone away and since John Chisholm became the Chief Executive of the DRA there has been much less talk about it and relationships between industry and DRA have improved tremendously again. There is now talk of something called secondary competition which is where a Chinese wall is erected in the DRA and one person sitting one side of that Chinese wall decides that a certain piece of work will be competed between another part of the DRA and industry. Our view is that that is equally as bad as primary competition because at the working level, the people in the DRA who might be subject to this competition, are under the same pressures as they were under primary competition and the same resistance to the transfer of information is a risk.

Lord Howie of Troon

198. I was attracted by the analogy which Dr Elliott drew earlier with the consulting civil engineer since I have a good deal of experience in that line of business myself in the past and I recall that when we designed power stations for the Electricity Board, as it then was, the Electricity Board had a large civil engineering technical department who functioned as advisers to the Board rather in the way Dr Elliott seemed to see the DRA acting as adviser to the MoD, where the consulting engineer of course was providing his information and the in-house engineering department was vetting it and advising on it and so on. Would you like to see that relationship continued? I rather thought you would.

(*Dr Elliott*) That is exactly the relationship that we see. We have, as a consulting company, a very strict code of neutrality. We choose to forego a lot of commercial opportunities so that we can stand up with our hands on our hearts and say, "Our independent advice is that you should do the following", but we are neutral, we are wholly neutral. The in-house group is responsible to the Secretary of State. I started my career 20 years ago when I was in the nuclear power industry, indeed working in one of the internal laboratories, and there is a very big difference it seems to me between being a servant of the Secretary of State, or a servant of the customer, let us say, and being a neutral adviser. Perhaps surprisingly our thesis, despite being a successful company selling neutral advice, is that there is a limit to how far we can be trusted because in the end we are answerable to us. We own our own company, so we have no outside shareholders, but our interest is to our company. Our concern is that along the line of looking for all the very good things about efficiency that come from introducing market forces and so on, it has been forgotten why MoD does research or indeed why the nuclear industry, the area I come from, did research. It does not do research primarily because the research needs to be done. I believe it does it primarily because it wishes to gain the expertise to be an intelligent and demanding customer and it has to have enough of that expertise on its side of the table to get any value out of it, so despite the fact that we have a very successful business selling consultancy to MoD, we are actually arguing that we need, and so does the manufacturing industry need, a demanding and intelligent customer on the other side of the table and they cannot be that if all they have got is people like us to advise them.

Baroness Hilton of Eggardon

199. Just pursuing the theme that we were on, is there any justification for DRA and if it exists why does MoD have to ask you for neutral advice, as you have been telling us about?

(*Dr Wilkinson*) I think it might be helpful to start off on this question of the justification of the DRA just to amplify what Dr Elliott said about why we think the MoD does research at all. I think there are two reasons. One of them is to ensure that the United Kingdom armed forces have access to competitive technology which will give them the edge they need to actually win if it comes to a war, but I think as important as that is this point about developing expertise which is embodied in people, to allow MoD to purchase equipment wisely and that includes specifying sensible requirements and understanding whether or not equipment offered by manufacturers will actually meet those requirements or not. The expertise is in those people and, as Dr Elliott said, there is a qualitative difference between a civil servant and a contractor. MoD must be able to rely on access to that expertise at all times. I think that where a firm like us comes in is that we are available to support the DRA in its work and when it comes to the MoD-PE demanding a particular piece of advice, we may actually be able to provide it more efficiently than the DRA can, but at the end of the day the DRA is the last bastion of the availability of that advice and defence is a long-term business. You cannot rely necessarily on the people being there in 15 years' time in the contractor base.

Baroness Hilton of Eggardon] I am not quite clear how the Ministry of Defence actually decides they turn to you for advice rather than DRA. That seems very odd to me. It seems to me that the sort of advice you are giving to them should be in the DRA rather than separately contracted. I find that puzzling.

Lord Dainton

200. Could you give an example?

(*Dr Wilkinson*) For example, we are engaged by MoD-PE at the moment to do a study of the defence communications strategy for the year 2000 and beyond. We are leading that study and the DRA are providing certain support into it, but it is a well-defined study with clear objectives to be carried out within the next twelve months or something and we will produce a report which gives the answers to the questions and it will then be taken off and dealt with by MoD and I think that is a different type of advice, a fundamentally different type of advice, from that which the DRA is in the long-term business of providing and which is always available at the beck and call of the Secretary of State.

(*Dr Elliott*) It is the intimacy that is different. It is the intimacy of that relationship that a civil servant can have that we cannot. We may be trusted, we may be accepted to be secure, but we are not intimate in that same way.

Baroness Hilton of Eggardon

201. That is a justification for DRA, but it does not justify the MoD using you. That is the thing that is confusing me, that it should be the DRA that should be providing advice.

(*Dr Wilkinson*) Well, let me say something about the DRA. I think it is important that it does just enough research itself to meet its long-term aims of being the fundamental adviser to MoD. It should not do more than is strictly necessary to meet that aim.

Lord Dainton

202. But in the course of doing this, it is bound to second-guess you and look at your reports and give advice to the Secretary of State to accept, reject, do part. Is that right?

(*Dr Wilkinson*) Yes.

203. But are you also saying that when it has done that, and, as you say, it is intimate advice to the Ministry of Defence, it ought not to be in the market place?

(*Dr Wilkinson*) That is right.

(*Dr Elliott*) More than that, if it is in the marketplace it undervalues or devalues its advice because the moment it does that it ceases to be seen to be intimate with the Ministry.

204. So curiously enough you have, as it were, a Government policy which says it ought to be in the marketplace for efficiency and washing its own face financially, but those who are already in the marketplace which are nothing to do with Government do not want it there?

(*Dr Elliott*) Do not want it there, and we are running a company so we cannot possibly stand up and say we are doing this for public spirited reasons but I do not think it is in the national interest to lose that capability. From our point of view we lose an intelligent customer and if we lose that intelligent customer they go to somebody cheaper down the road. But I think our principle—this came up earlier, this problem about the complex—is that on the one hand we are arguing that the market is incompatible with DRA's role and on the other hand that would lead to inefficiencies and other things and I think that cannot be avoided. We are arguing that there is a certain core role which has to be in the public sector and that must remain so, because otherwise we forget why we do it, but only that core role should be in the public sector. So to answer the question of where we come in, where it is possible to contract it out, very good, let us do that and we would hope we could do the job more efficiently. I know there has been some concern that industry is worried about the threat from DRA. I can assure you that is not the case. DRA is worried about the threat from industry. We do not feel threatened.

Lord Howie of Troon

205. You are not worried about that because you lose an intelligent customer (in your words) but you also gain a competitor?

(*Dr Elliott*) Not as yet.

206. You do not fear them as a competitor?

(*Dr Elliott*) No, certainly not.

Lord Dainton

207. If they are wanting to get income they are bound to be competing at some stage, are they not?

(*Dr Elliott*) Yes, and that is why they should not want to get income because why do we have a DRA at all? We have a DRA to provide a special function which you cannot buy from industry. Turning it into industry will mean MoD will be without that service.

208. So my original statement was correct?

(*Dr Elliott*) Yes.

Baroness Hilton of Eggardon

209. I am not clear, if a contract is placed with you has DRA advised it is something outside their competence or is the decision taken elsewhere within the MoD?

(*Dr Wilkinson*) No, if a contract is placed with us that will be because somebody in the MoD has decided we can provide the advice in a more timely and efficient cost-effective manner for that specific piece of limited advice.

210. So there is somebody in MoD with scientific knowledge who is defining the elements of the DRA?

(*Dr Wilkinson*) Yes.

(*Dr Elliott*) And they usually have learnt their trade by having been DRA people in the past, as the previous speaker was.

(*Dr Wilkinson*) Yes. I should say that one point which is coming out of the Trading Fund issue which was mentioned earlier is that the Trading Fund could be very bad if it inhibits the flow of people between the research function, the specification of requirements function and the procurement of equipment function in MoD. The expertise that the research generates is in these people and if they are not allowed to move around freely within those different functions there is no point in generating the expertise.

Lord Dainton

211. I am beginning to get the feeling, my Lord Chairman, that the arrangement which both you and the previous witness describe is a kind of recipe for

[Lord Dainton *contd.*]

schizophrenic management within the DRA. Is that unfair?

(*Dr Elliott*) If they are pressured to be both in the marketplace and impartial government servants. "Schizophrenic" is perhaps an extreme term for it but it is a conflict of loyalties, I would say.

Chairman

212. I would like to pursue this further because in terms of research management there is often a case put forward by research managers that if they are to have a credible research capacity they should be allowed, in certain instances, not always, to go to the marketplace in order to test the validity of the research and, indeed, to motivate the research worker. Research, I think you would agree, is a seamless robe. It is very difficult sometimes to discern how far down the particular spectrum you may have moved. Do you think that it is compatible with maintaining the quality of a Research Establishment to determine that the marketplace is out of bounds?

(*Dr Wilkinson*) I think that there are certain marketplaces which must be absolutely out of bounds, for example working for defence electronic companies where their impartiality is absolutely essential. There may be areas of the marketplace, for example other government departments, work done by, just to name an example, British Gas, where there may be some benefits if they have surplus capacity in being allowed to bid in in competition with industry. But I come back to the point I made earlier, which is that I believe the DRA should not be bigger than it needs to be to meet its requirements. It should not be in competition. They should have MoD's total allegiance, so to speak, but they should not then be allowed to be bigger than they need to be to meet that specific defence requirement.

213. I understand from the paper that you have submitted to us that you do not exploit intellectual property rights from anything you might have generated, is that correct?

(*Dr Elliott*) That is a fundamental premise that we have to build on as independent advisers, yes.

214. I go on, therefore, to ask the question whether you think DRA should be exploiting intellectual property rights, or rather the MoD should be exploiting intellectual property rights on behalf of the DRA?

(*Dr Elliott*) That is a twist on the question, the second half, which is rather different. I have had this argument with a lot of DRA people, and I expected that. I thought of an example before arriving, an example of a piece of technology that DRA developed which is thought to be very good indeed, the so-called Sprite infra-red detectors. They actually own the intellectual property rights in the DRA and, as I understand it, if people sell an infra-red sensor, use them, they receive a licence fee. If MoD ask DRA to advise them on which infra-red system to buy and one of them includes the Sprite detectors, the problem arises not when DRA thinks that the other one is better, because in my experience of all the people I have ever met in DRA and in industry they have said the engineers tend to be quite honourable and would say so. The problem arises when they actually genuinely think the product in which they have a vested interest is better, and they say so, which first of all causes considerable raising of eyebrows in the losing competitor but also the Minister or, if you like, his servants in MoD-PE, have to ask how valuable that advice is. We have always argued that the exploitation of intellectual property rights *per se* is not compatible with being an adviser. If MoD owns that work and permits one of the vendors to use it, then indeed they might expect to pay less for it in some sense as the customer. So that does not seem to be a conflict, but this idea that DRA can generate income by exploiting commercially the intellectual property rights out of its work seems to be incompatible with the DRA we are trying to describe. We think we cannot do that as a private company and still be an adviser.

215. Though you accept, of course, that it would be very difficult to deny that where public funds are generated into intellectual property rights they should be exploited, but not by this particular Agency?

(*Dr Elliott*) The ability should be exploited, that is to say, the knowledge has to be exploited. I am distinguishing between the rights and the knowledge and that is to do with actual transfer of money. If we have developed a clever infra-red detector then we certainly ought to see British forces benefiting from it. The rights issue seems to be secondary and should never be allowed to cloud the advice role, and there is a danger in all this that we are letting the tail wag the dog. We must always come back to the fundamental reason, why does MoD do research and why does it need the DRA? If we then say, "Wouldn't it be nice to do these other things," which are incompatible with the first one, then I believe we have a conflict.

Lord Dainton

216. One of the objects of this exercise is to get industry getting some of the technology which exists within the DRA and you seem to be arguing that that becomes almost impossible?

(*Dr Elliott*) No, I was careful to distinguish between intellectual property rights and intellectual ability and I think that is a distinction that is not often made. It is not made—this is perhaps an aside—in the funding of academic science in this country. Our policy states in the Government White Paper that we would exploit intellectual property rights, which is a mistake. What they actually meant was the intellectual ability in the universities. No, I see no problem, indeed quite the opposite. We want to see British industry, since their taxes pay for it, benefiting from the technology. That is why we have to have a very intimate relationship also between industry and the DRA because technology transfer, we would argue very strongly, does not occur on paper, it occurs in the minds, in the guts of the people who do it. So we want to see people mixing and again that is another reason to worry about the competitive relationship between industry and the DRA, that it will reduce that flow.

Chairman

217. Could I follow that up specifically? I would like you to comment on Pathfinder and dual use technology centres and to what extent you feel they fulfil the role.

(*Dr Elliott*) On Pathfinder first: in principle my interpretation of the Pathfinder concept is that the defence customer lays out a shopping-list of problems and civilian companies lay out their shopping-list of problems, and where they happen to coincide the two parties get together and say, "That's jolly interesting. We have a common need. Let's share the cost of solving it." That seems to be a very attractive proposition and my concern is that there is a danger in that process, that actually what happens is that the industry that chooses to lay out its shopping-list is entirely the defence supply industry. There is a danger that what actually happens is that government funding of research gets hijacked by the defence industry and the defence industry gets a subsidy for developing its defence products which it is then going to sell back to the Ministry of Defence and then the Ministry has lost control of its research budget. Pathfinder sounds a splendid idea in principle, providing it is well policed. I quote that as one of the examples of why you need a strong government Defence Research Agency to be able to police that. On the other side, the dual use technology centres, that again seems to me the very worthy and satisfactory idea that if we are going to establish a capability, it should be open to be used by industry, but it is not the centre that causes the transfer, it is what you do with it, and providing industry is actually going to make use of its facilities and act as a customer, then they will be dragged through, but if there is no customer for the sort of work that is done in the centre, then there is a problem. We heard earlier mention of the United States and if you look at the way it is done in the United States, they have an agency called ARPA, and in a burst of honesty this Administration has dropped the "D" from its name because it has always had civilian activities, and that acts as a customer for those activities for which you cannot write a business case which maybe in five years' time will make a new industry. If we had that going on, then the dual use technology centre concept seems to work, but if it is just paying lip service, then I do not think it makes a lot of difference. My point on the dual use technology centres is that the centres are fine, but it is what you do with them that causes the effect.

Lord Dainton

218. You suggest somewhere that the right way to do this is for government and industry or the DRA and industry to find some common generic work to do together. Is that right?

(*Dr Elliott*) I do not think I would use the word "generic".

219. It is in your paper.

(*Dr Elliott*) Oh dear.

220. It is a generic problem.

(*Dr Elliott*) I may have put it in as a loss-leader! I probably put it in because it is a very fashionable term at the moment. I think the thrust behind what we said was that people solve problems in response to customers and people do not solve generic problems. They solve problems because they have a problem to solve, either a military threat or a commercial threat. We probably put the word in deliberately as a hostage because if these centres are solving generic problems, that does not actually do any good for anybody and we are very concerned in other fields, in civilian areas, about this concentration on generic technology which almost by definition is useless. It is what you do with it that is useful.

Lord Howie of Troon

221. If we look towards the bottom of page 1 of your paper at the end of the second to last paragraph, you say that "industry's prices may reflect a willingness to subsidise research in order to capture the subsequent supply market". That seems a sensible enough comment. Have you got any direct evidence of this happening or is it just a possibility which you can see?

(*Dr Wilkinson*) The answer is that we do not have any direct evidence, but it would be not unreasonable to suppose that a manufacturing company might see some benefit in doing research in an area which will lead directly into products for that company.

(*Dr Elliott*) We can be a touch more honest; we do it ourselves.

(*Dr Wilkinson*) We are not a manufacturing company.

(*Dr Elliott*) No, but we do it because we want to capture the subsequent research market.

222. You did mention loss-leaders in your last answer which seems to follow here.

(*Dr Elliott*) It is a good commercial practice.

223. Is there a temptation here then for your research to produce results which would be advantageous to you in the later part of the market rather than your customer?

(*Dr Elliott*) One of the most difficult problems we have, since we have sat here and told you how wonderfully independent we are, is when our considered opinion to our client is, "We recommend that you should research this problem further". That is a very difficult answer to give because we have a vested interest in saying that, but the reason we put this in was because of the discussion we have had several times this morning about the need to use the market to keep DRA sharp. Our concern is, first of all, that is an intrinsically bad thing because it destroys the relationship and, secondly, it will not work anyway because the market is not a true market and you will not be actually getting realistic figures quoted from the people who are testing.

224. This means then that the DRA must be extremely careful when it asks the question?

(*Dr Elliott*) Indeed, the DRA has to be very careful and we have had a number of occasions where we have bid for work and lost it because manufacturers have offered to do the work for half the price we have quoted. I am glad to say that on a number of occasions we have also seen DRA have the courage and the strength to stand up to their financial people and say, "This is too important for one manufacturer to hijack. We will pay the higher price to have an independent assessment".

225. I am glad to hear that because I was just about to ask you about that.

[Lord Howie of Troon *contd.*]

(*Dr Elliott*) We have seen both happen and one of the reasons why we feel so strongly that MoD should maintain an impartial and independent customer capability is we need it to make those judgments which suit us very well.

Lord Craig of Radley

226. You concentrate a lot on DRA's relationship with MoD and you have been very clear and frank about that. DRA also work for other government departments, such as the DTI. Is there anything you would wish to say about that relationship as viewed from your side of the playing field?

(*Dr Elliott*) We start from the idea that excess capacity should not go to waste, so the premise starts off that we should have the minimum size DRA necessary to meet MoD's need, and that includes peaks, times of tension or conflict, so we have to have a DRA that is bigger than its average need, so we have got excess capacity, so let's use it. Providing that does not lead to a conflict of interest with the primary function, that is great, so work for other government departments is an obvious route, and work for non-defence companies seems to me exactly the same. We are concerned where it is in competition with industry as to how on earth you work out a correct price for DRA, but in principle it seems to me to be no harm. If DRA has the capability under-used and other government departments need it, excellent.

227. Could you take that a step further? You might wish to sub-contract some of your own work to DRA.

(*Dr Wilkinson*) Indeed we have done that.

(*Dr Elliott*) Where they are the source of expertise, we bring them in.

Chairman

228. Could I take you back to the Pathfinder and the last sentence of the written evidence you have submitted in which you refer to the Pathfinder project and I think I detect a feeling that at the moment Pathfinder has to have a clearly stated military need and a parallel civil interest, or that is what you propose in your paper. Do you feel at the moment that the Pathfinder project is unduly constrained into defence and allied industrial work?

(*Dr Wilkinson*) It is not clear precisely what the rules are to members of industry. It is clear that the idea is that industry puts in ideas which it thinks should be in the defence research programme and if it believes that there is some potential benefit spinning off from that work into the civil area, it reduces its price for doing the work accordingly to take into account the potential long-term benefits to it. We do not really know what programmes have been funded and what the impacts of them have been so I think it is difficult to answer your question categorically.

229. I read your proposal here to be that you think at the moment the industry needs have to be for military products and you would like to see wider civil applications.

(*Dr Wilkinson*) Absolutely. I think that is correct.

(*Dr Elliott*) It is not that they have to be military products. The concern is that they are only for military products. Pathfinder is very attractive if it does achieve this alignment, but superficially it flies in the face of 23 years of Government policy. We are back to Lord Rothschild's customer/contractor principle and it seems to be rather strange that after many years of pursuing customer/contractor we are now asking the contractor to tell the customer what he should do. So it has to be handled very carefully, otherwise we have lost sight of the fundamental principle of the relationship between Government and industry.

230. It is not necessarily strange, is it, to have a different perspective after 23 years as to how these arrangements should be conducted?

(*Dr Elliott*) No, but the customer/contractor principle is running through the whole of the DRA initiative. It is an underlying basis for its whole activity.

231. But I think what I understand you to say is that you welcome a fairly flexible attitude, given that there seem to be benefits for civil interest and these should be clearly encouraged even if they may not have an immediate military application?

(*Dr Wilkinson*) Correct. We would encourage that but we maintain the view that the defence vote is voted for defence and defence money should not be routed through to civil causes by a back door.

232. But why not if there is a joint interest between military and civil interests which are unmilitary?

(*Dr Wilkinson*) Jolly good.

233. You sound like the Treasury at times, if I may say so.

(*Dr Elliott*) We recognise the rules which are unlike the United States, where DOD recognise a role to help American industry.

Lord Howie of Troon

234. Do you think there is very much scope for this spin-off into civil use?

(*Dr Elliott*) Let me give a personal view. Technology transfer is a very attractive term and rarely as it is normally perceived has a lot of substance because the technology you developed for a submarine, for example, the nuts and bolts, almost certainly are inappropriate for tractors. What is valuable is the wisdom, the experience of the people who worked in it, and so a mechanism where people can move about is very valuable, but the idea that you invent a "widget" and then you patent it and you license it to tractor makers, which is a sort of simplistic view of technology transfer, which we tried to shoot down in our evidence, does not happen very often. To take a very different field, there was an article in *The Economist* about three weeks ago on this, that there is a popular belief that the American moon-landing programme brought us the non-stick frying-pan. The real value was the expertise of contractors in managing complex programmes which they have gone on to use in totally different fields. That is a technology you cannot pin down, write a report for and sell, but those people ended up wiser and more valuable as a result of it. That is the technology we would like to see being transferred.

Chairman

235. Are there any other questions anyone would like to put? You clearly are concerned that if DRA maximise the income, this might be done to the detriment of their primary function, which is to provide expert advice to the Ministry of Defence on procurement? That is, I think, the message that you are giving?

(*Dr Wilkinson*) That is absolutely right.

236. Are you prepared in any way to concede that in so far as it might be possible to generate income and at the same time to provide expert advice to the Ministry of Defence, that, all things being equal, is desirable?

(*Dr Elliott*) Of course.

237. I am making the assumption that they have not gone so near to the marketplace that they have lost their impartiality. There could be situations, would you agree, where there might be money generated for the Ministry of Defence?

(*Dr Wilkinson*) I think that is very desirable but it must not be used as an excuse to increase the size of the DRA to a bigger size than it strictly needs to be within the public service to meet its requirement. An interesting question is how big is that and that is a question that I would not like to try and give an answer to. It certainly needs hands-on experience to have the capability of being an intelligent customer and judging what the contractors are doing, it needs to plan and manage research, I think, and do some of the research itself, but there is a question as to where is that line, which I think is a big question I would raise.

Lord Craig of Radley

238. You seem, without taking this too far, to be advocating a minimum cost DRA to do its function?

(*Dr Elliott*) Minimum size.

239. Minimum size and, therefore, minimum cost?

(*Dr Wilkinson*) Yes.

240. Rather than the most cost-effective establishment on the other hand by marketing some activities, indeed you are quite happy to use them yourselves as a contractor, to increase your cost-effectiveness? Whilst not losing that, I think we are all at one that there must be within the DRA a sufficiently expert body of knowledge on which the Ministry of Defence can draw. I am just wondering whether you are going along with the minimum cost and minimum size rather than with the most cost-effective.

(*Dr Elliott*) I think there are two quite separate issues. We are arguing minimum size because we accept—and we would, coming from private industry—the premise that there should be the minimum amount of government, so let's minimise it to what it has to be, but it is not a cost-effectiveness issue. I think most people, following that argument, would say that private industry is generally more efficient than the public sector, although I am not sure that is true, but that is a common belief, but we are not discussing efficiency. We are saying that that option is not available. To do the job which has to be done, it has to be in the public sector and that may not be the most cost-effective and best way of doing the job, but it may be the only way. I am worried about this creeping "marketisation", if that is the right word. With respect, my Lord Chairman, your question sounded like the housemaid's baby; it is only a small one. If it is only a little bit partial, then its value is already reduced and I do not think there is room for any greyness in this. Either it is on the side of the Secretary of State or it is not and the moment it has other interests, you have to question that. Caesar's wife is supposed to be above suspicion, and the moment you lay yourself open to suspicion, you devalue the advice that you sell. That is the corporate position for our company and I think there must be an even stronger case for a government department.

Chairman] Is there any further question anyone would wish to put? If not, Dr Wilkinson, Dr Elliott, thank you very much for the very clear way in which you have put your views.

Memorandum by Dr D R Wilkinson

I should be grateful for an opportunity to clarify the evidence that we presented to the enquiry into the DRA. Our evidence was concerned with how DRA should assist MoD in its role of the defence of the nation. We did not particularly address the role of defence expenditure in support of technology in the economy at large.

In other countries, notably the USA, the Department of Defense has a broader role which includes promoting the technological health of the nation. We strongly support the view that there are technological activities which are good for the nation but which lie outside the remit of industry. Under these circumstances, there needs to be a mechanism for government to act and a broader use of defence research may be appropriate.

I believe, in retrospect, this view did not come over very clearly in either our written or our verbal evidence. We should welcome an opportunity to pursue this broader question with any members of the Committee who are interested.

Dr David R Wilkinson

Managing Director

7 March 1994

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HOUSE OF LORDS SESSION 1993-94

MINUTES OF EVIDENCE

TAKEN BEFORE

THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

(SUB-COMMITTEE II DEFENCE RESEARCH AGENCY)

Thursday 10 February 1994

INSTITUTION OF PROFESSIONALS, MANAGERS AND SPECIALISTS

Dr V Ellis, Mr R McDowell, Dr N Peeling and Mr W Wildash

MANUFACTURING, SCIENCE AND FINANCE UNION

Mr T Webb

DEFENCE RESEARCH AGENCY INDUSTRIAL TRADES UNIONS CONSULTATIVE COMMITTEE

Mr S Clarke and Mr C Jordan

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THURSDAY 10 FEBRUARY 1994

Present:

Craig of Radley, L.	Renwick, L.
Hilton of Eggardon, B.	Selborne, E. (Chairman)
Howie of Troon, L.	Dainton, L.
Redesdale, L.	

Memorandum by the Institution of Professionals, Managers and Specialists

EXECUTIVE SUMMARY

The Institution believes that, given the policy decision to move to a trading Fund status the broad strategy which the DRA is pursuing is sound. We do however have criticisms about the pace of change and the detail of the methods by which the DRA's objectives are being pursued. These have shaken the confidence of the staff on whom any successful "leading edge" research organisation is highly dependent.

There must be proper funding and strategy for long term research; an appropriate and close relationship with MoD must continue; and defence research must not be abandoned to market forces. Measures must be taken to help diversification and to link DRA with civil research objectives and organisations as well as military ones both within the U.K. and internationally.

Above all, the Institution is concerned that if the process of commercialisation goes too far and if the status of DRA were to move from a "Next Steps Agency" with trading fund status to outright privatisation a unique national defence capability will be lost.

As an executive agency with trading fund status, and given the right support and opportunities, the DRA can continue to be a world beater and the staff are determined that it should be so.

INTRODUCTION

The Institution of Professionals, Managers and Specialists is the largest single union representing staff in the Defence Research Agency, having approximately 3,500 members employed in the DRA. The Institution is in a similar position within the Ministry of Defence having approximately 16,000 members employed directly by the MoD. Representing as it does all specialist grades, many of whom are scientists and engineers, the Institution is ideally placed to comment on the issues raised by the enquiry.

1. THE DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH MoD

1.1. *How independent of the MoD is the DRA?*

1.1.1. The DRA is progressing rapidly towards a situation where it will be administratively independent of the MoD. The setting up of a trading fund as from 1 April 1993 has been the main impetus for this change. The trading fund has also brought with it a cultural change to a more commercial approach, and a large rationalisation programme whose speed and method of implementation has left the staff demoralised, and in many cases, uncertain of the future.

1.1.2. The MoD/DRA relatonship is critically inter-dependent. The DRA is currently dependent on the MoD for 90 per cent of its funding, and although plans are in hand to increase the proportion of non MoD funding, the DRA clearly needs the MoD to supply the commercial stability required to make a post trading fund DRA a commercially viable organisation. At the same time, the MoD is critically dependent on the DRA for a continuing level of high quality advice. The relationship depends on DRA continuing to be very open about its corporate intentions with the MoD, and on the MoD acting as an intelligent customer. Any cuts in the personnel in the MoD, who act as DRA's customer, or the ability to tap into DRA expertise, would seriously jeopardise this relationship and the quality of UK defence.

1.1.3. Morever, the move towards administrative independence has meant that administrative skills, hitherto provided in the main by the MoD centrally, have now had to be duplicated by the DRA. The MoD, being the main DRA customer, will have to pay for this. In the private sector commercial organisations with such a high level of inter-dependency would seek to merge to reduce operational costs through the administrative effectiveness so gained. The case, therefore, for a close relationship between the MoD and

DRA remains strong on both cost and effectiveness grounds, and must be considered urgently before the current rate of divergence in conditions of employment renders it too difficult to achieve.

1.2 *Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

1.2.1. Trading fund status has benefits and costs. Looking on the positive side, trading fund status has forced a more commercial approach which gives greater emphasis to customer satisfaction and value for money. Moving away from the old sole supplier relationship has increased openness about DRA's operations and costs so that MoD can now be confident of the quality and price of research it buys. Against this, there is evidence of a worrying trend towards shorter term research. As the President of the Royal Society recently argued, "Investing for the longer term and supporting open-ended research, which might bear fruit only in the next generation, requires courage and vision". He pointed out that such a strategy is incompatible with a competitive commercial environment. There is a real danger that jobs cut to save money in the short term will be at a significant cost in terms of on-going research and lost scientific expertise.

1.2.2. Many of the scientific staff in the DRA are convinced that the DRA's status as a trading fund is a hindrance in its pursuit of its role as provider of the highest quality research. Too much emphasis has been placed on the evolution of new management processes to satisfy the customer/contractor interface, against ensuring the continuity of an effective research base, particularly for longer term research.

1.2.3. The nature of the customer/contractor interface has resulted in the need to measure progress by the transfer of the knowledge base resident within the research establishments to the relevant programme offices, which are the budget holders. This has led to duplication of effort. At its most basic level, the work involved in running the outward looking interface from MoD is paralleled by the efforts put into organising a similar interface within DRA. The interface is, however, necessary and is essential in maintaining MoD's intelligent customer role.

1.2.4. The customer/contractor relationship is also driving a perceived need to meet the quality standard BS 5750, which is resulting in considerable inefficiency and will be no guarantee of any further improvement in research quality. Indeed, BS 5750 is only likely to guarantee the timely delivery of research of modest standards. The discipline inherent in BS 5750 and other so-called total quality management processes (TQM) are too rigid to benefit organisations at the forefront of advanced technology. The procedures are too bureaucratic and too cumbersome to take account of the evolving priorities inherent in innovative research programmes. Several of the world's leading manufacturing companies have recognised that, whilst TQM may be of benefit in a production environment, its value in research is dubious. Many such companies (eg Sharp) are already examining other strategies to ensure the level of advancement that they seek, in order to avoid the pedestrian progress otherwise likely to ensue.

1.2.5. The need to maintain its current position is also driving the DRA to invest considerable effort in marketing its "product" to MoD. As the MoD "market" declines, it is expected to compensate for this by winning other business on a broader front. This is likely to lead to the redeployment of some 100 or so of its best research scientists as technical sales executives during the coming years, so reducing its capacity for maintaining its position at the cutting-edge of technology. While BS 5750 has other benefits—for example as a marketing tool—it is questionable whether in enhancing efforts to "sell" itself, the DRA may at the same time be undermining its own position at the frontiers of research.

1.3. *How does the DRA's status affect its research strategy?*

1.3.1. One consequence of DRA's new status is that research strategy is affected by the need to generate income. The DRA is starting to focus its research strategy more towards meeting near-term objectives. It is becoming more difficult to protect certain areas of strategic enabling technology, especially at times when pressure on the Defence Budget is giving the MoD customer no time to consider the implications of reducing funding levels in key areas of need. Valuable intellectual and capital assets are at risk.

1.3.2. A proper balance between long term and short term research objectives must be retained in DRA if it is to preserve and improve its 'leading edge" capabilities. As part of the process of providing the "seedcorn" for the future of DRA and sustaining its intellectual capital, the Rothschild principle of an element of surcharge (the Rothschild 10 per cent) on each contract to be allocated to non-project specified research needs to be safeguarded in a way which does not put the DRA at a competitive disadvantage with other suppliers.

1.3.3. The drive towards creating a greater level of visibility and accountability to the customer is resulting in the division of strategic areas of research into separate Assignments, thereby significantly adding to the administrative overhead. In the Quality Assurance area some activities are subdivided into 300 or so separate tasks with programme values of as little as 500 each. Some of the important aspects of Quality Assurance have been reduced to a "jobbing shop" activity.

1.3.4. Processes of competition are also being considered on an intra-mural basis on the assumption that this will lead to improved efficiency and performance. Such procedures are divisive and counter-productive to processes of collaboration and cross-fertilisation that are of paramount importance in any research organisation at the leading edge of technology.

1.3.5. The current DRA corporate structure has been founded on a strategy which is unsuitable for the evolution of a successful research organisation. Difficulties with operating an Engineering Services Division as a separate profit centre have already become apparent and have resulted in the loss of staff, expertise and capital facilities that may be impossible to replace. Defence needs systems which are totally reliable and of very high quality. Because internal Engineering Services tend to carry a higher charge than some external suppliers, they are not being used. To produce high quality weapons systems, skills of a high order from "shopfloor" to "leading edge" scientists are required. It can damage the scientific capability if engineering support is not integrated and of the highest quality.

1.4 *How has the MoD's system of research package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading Fund status?*

No comment.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

1.5.1.The DRA's new status is making it more difficult for MoD to gain access to expert, impartial advice. Its role as an honest broker could be eroded as more and more applied research is opened to competition. The same is true in its interactions with other Government departments. Private industry is becoming increasingly more concerned about DRA's role as a potential competitor, rather than seeking the level of partnership essential to the future evolution of technology, to the benefit of wealth creation.

1.5.2. However, IPMS is optimistic that if the appropriate policies are pursued, the DRA's new status could prove beneficial in its relationships with customers from public and private sectors alike, The MoD and other Government departments should welcome changes in DRA which appear to equate a commercial orientation with improved responsiveness and better value for money. If, at the same time, DRA is able to distinguish itself from private sector competitors and retain its reputation as an organisation dedicated to serving Government's interests, the MoD and other Government departments may consider that they have the best possible balance of research orientation and commercial practice. However, this depends crucially on the DRA retaining its role as honest broker.

1.5.3. It also depends on DRA retaining a class relationship with MoD. As the Audit Commission has warned, too rigid a separation between customer and contractor, irrespective of particular circumstances, can result in a burgeoning of bureaucracy at the expense of quality of service. It makes more sense in DRA terms to provide for continuing DRA involvement in the role of "intelligent" customer and adviser to MoD so that policy can continue to be informed by those who are actually working on research.

1.5.4. The current Government pressure to compartmentalise institutionally the roles of "customers", "contractors" and "policy makers", rather than simply recognising their separate roles, will greatly hinder the free flow of people and ideas, impoverish the quality of advice and reduce the ability to be "intelligent customers" for research. There must be close communication between researchers on the one hand and those who need to make use of the research on the other. In the real commercial world good "customers" take the trouble to cultivate and establish close links with "suppliers"; they do not normally "shop around" at "arms length". Rothschild also endorsed this approach in the original exposition of the "customer-contractor" principle, advising that "departmental customers" must work in partnership with their research and development "contractors", whether inside or outside the Department. An essential feature of this approach is provision for continuing discussion and partnership between customers and contractors and with the interested sections of the community. [*Framework for Government Research and Development, July 1972.*]

1.5.5. In looking at DRA's wider relations, IPMS would argue for stronger links with DTI and the private sector, both in terms of developing dual use applications and in encouraging and supporting innovation by companies. There is a major and continuing problem of technology transfer within the UK and DRA should have an important part in bridging the gap between research and application. In line with the dual objectives of the White Paper, to improve quality of life as well as wealth creation, this role should be broadly defined including, for example, work on issues of public and environmental safety.

1.5.6. One example of collaboration with industry is shown by DRA's success in Esprit. One of the most successful Esprit I projects (Supernode—building a parallel computer out of Inmos transputers), was lead by DRA Malvern. One of the highest profile Esprit III projects ANDF–DEPLOY into portable software and Open Systems is based on DRA developed technology. The NERI (National Electronics Research Initiative) called RIPR (Research Initiative in Pattern Recognition) was a multi-company initiative at Malvern which was established at Malvern because of strong industrial links of the DRA's image and speech processing research. Industry will benefit from a world class R&D organisation which can play an honest broker role within the UK.

1.6 *How is the process of formulating a strategy for the DRA being affected by the new thinking about defence and foreign policy, following the end of the Cold War?*

1.6.1. With the demise of the Soviet Union, the likelihood of sporadic regional conflict has increased. The ex-Soviet Union countries are finding ready markets for their surplus equipment, driven by their struggle to gain economic stability. Increasingly, advanced weapons are also emerging in other regions as a result of commercial sales by Western organisations. The need to apply new technologies to maintain a competitive edge over potential adversaries will become an important strategy for the future. In some cases, a rapid response will be required to deal with such emerging threats, which would be difficult given the current bureaucracy associated with the MoD/DRA interface. Similar arguments apply in the case of the continual battle against terrorism.

1.6.2. Moves in DRA technology towards smart weaponry, advanced CIS, interoperability, advanced sensors, cost reduction through increased use of commercial technology, are very well in tune with the need for flexible, cost effectively equipped forces well suited to the low-intensity conflicts that the UK is likely to be involved in. It is to be hoped that the UK follows the lead of the USA in realising that in the current political climate it is prudent to maintain appropate R&D investment, and to redeploy the highly skilled teams working in defence research. In particular, Government should learn important lessons from the privatisation of AWE, which put a key area of scientific capablility outside direct public control. It is a commercial fact of life that if privatised establishments lack Government orders, they will seek contracts elsewhere, thus adding to the dangers of weapons proliferation. It is also worth noting that when the DRA was established, a number of governments and other organisations indicated that continuing government control was crucial to the maintenance of agreements on the exchange of scientific knowledge.

1.6.3. The new climate of uncertainty in the international situation puts an even higher premium on planning for the long term in defence R&D and retaining flexibility to meet any contingency. The experience of the Gulf War shows that the use of high technology can minimise casualties. Moverover, dual use technology would have the advantage of enabling fast "build-up" of military capabilities as well as facilitating the current "run-down". But preparation for such contingencies needs to be carefully planned. The present Government's laissez-faire ideology and "short-termism" of approach will not provide a sound basis for such preparedness.

1.7 *The DRA, like its predecessor organisations, has as its primary role the provision of research services to the MoD. In the past, however, the defence research establishments have also provided other (non research) scientific and technical services to the MoD (significantly so during the Falklands and Gulf conflicts), as well as to other Government departments and private customers. How far should the DRA continue to provide such services, and to whom?*

1.7.1. The former MoD research establishments were not only providers of a research service, but the source of much of the expertise upon which the MoD and the Armed Services based decisions for future procurement. Since the research establishments and the MoD were all part of the same organic organisation, there was no barrier to transfer of knowledge and advice. As needs arose, Operational Research Branches could communicate directly with experienced groups within the research establishments, and at times of conflict, could refocus work programmes to address critical issues with the minimum of adminstrative effort.

1.7.2. The capability of DRA to provide a range of scientific and technical services to MoD and other customers is one of the most important features that distinguishes it from a purely commercial organisation. That the DRA is able to provide emergency services in times of war is a source of great pride to a staff committed to serving the public interest. Again, it is also a powerful argument for maintaining DRA as a Next Steps Agency and for ensuring that it is not privatised.

2.1 THE DRA'S MANAGEMENT, INTERNAL AFFAIRS AND CORPORATE STRATEGY.

2.1 *Will planned restructuring and rationalisation affect excellence or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?*

2.1.1. DRA's planned restructuring and rationalisation measures will certainly affect excellence. Some of the arguments relating to the introduction of total quality processes have already been highlighted in the comments on question 1.2 above. There is a clear distinction between the meaning of "Quality" inherent in high quality research, and the so-called "total quality" sought in some management processes.

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting-up of the Agency?*

2.2.1. The pace of rationalisation is not a logical consequence of the formation of the DRA as such but of the implications associated with the financial discipline set by the Treasury. Guidelines for treatment of capital assets have resulted in an artificial representation of the true cost of running the business. Had the research establishments been left within MoD, there would have been no problems related to asset valuation. In many cases, the costs associated with setting up the facilities had been met in the previous budget years and were of a non-recurring nature. Associated consultancy and accounting costs would also have been avoided.

2.2.2. That said, the pace has been far too fast. Neither the DRA nor the MoD were adequately prepared. For example the Quality Assurance Technical Support Unit was the first DRA business unit to fail, partly because repayment for its services was now required and this had not been provided for in the relevant MoD budgets. Time should have been given for work to be reduced and for customers to be ready to pay. While speed has been essential, it has severely overloaded management and exposed weaknesses. Much of the restructuring has been introduced inefficiently and too hurriedly, resulting in staff demotivation.

2.2.3. Indeed, the morale of staff in the DRA is at an all time low. The ablest scientists should ideally be motivated by the work that they carry out, rather less so by the financial rewards associated with their high level of performance. The research establishments have for many years operated at the technical cutting edge. This attracted some of the best young scientists that Britain has produced, in the knowledge that they would be working in an intellectually stimulating environment with unique access to the results of research within industry and, in many cases, that provided by other governments. The environment created within the research establishments ensured the retention of the best staff. The recent changes have seriously damaged this environment at a time when the need for exploitation of advanced technology as the basis for wealth creation and secure defence is paramount.

2.3 *What are the implications for the new regime's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?*

2.3.1. The staff within the DRA, through their trade unions, have striven to ensure that their conditions of employment and employment rights would be protected during this period of rapid change. The speed of change combined with the "macho-management" approach adopted by DRA senior management has meant the need for meaningful consultation with the trade unions representing the staff has been met by tight and unreasonable deadlines, which has resulted in the view of staff being virtually ignored on some major issues.

2.3.2. The institution has striven to ensure that the difference between the MoD and DRA conditions of employment are kept to a minimum in order to maximise the essential interchange arrangements which all parties are agreed upon.

2.3.3. Like several other Agencies DRA will be taking delegated powers on pay determination in April 1994. Early indications are that the pay systems for DRA staff will differ substantially from the MoD, which will make the interchange between them which is so essential much more difficult.

2.3.4. Moreover, the delegation will take place in a context of general public sector pay restraint, continuing economic recession and a slack labour market—which includes a high level of unemployment among the graduate population. In these circumstances, and recognising also that the DRA is a major employer of specialist staff, IPMS' concern is to secure some improvement in terms and conditions that already compare badly with the private sector and to ensure that morale is not further depressed. IPMS has the impression that in DRA and the other Agencies affected there is an alarming vacuum in management strategy, with virtually no thought yet given to developments beyond 1994. Such uncertainty added to fears about job security is not good for employee relations. It is particularly damaging in an organisation like DRA where much project work depends on the long term commitment of skilled staff.

2.3.5. Looking ahead, on the assumption that the economy does recover, pay delegation poses a different kind of threat. The comparatively low pay of public research scientists has been well documented. In a better economic climate there is nothing to stop the most able taking their skills either to the private sector or abroad unless the DRA is prepared to pay to keep them. This is more likely to be a problem in the future if differentiated pay and conditions block off normal channels of career progression through and interchange with other parts of the MoD.

2.3.6 As far as the actual pay systems chosen and the DRA's attempts to relate pay more closely to individual performance are concerned it is increasingly being recognised in studies of performance pay that their impact in raising performance is not proven and that poor systems can demotivate staff. Based on their experience in DRA so far the staff have little confidence in management's ability to provide a fair, workable, and effective system.

2.3.7. Pay and grading systems for DRA need to be carefully designed to meet the need for easy interchangeability with MoD and other departments, agencies and public bodies, to retain the link to the general system of external comparisons embodied in the current civil service pay system, to have fair internal relativities, and above all to have a system which commands the respect of the majority of the staff, which is essential to high motivation and high morale.

2.4 *Pathfinder is the DRA's programme to allow private companies to gain access to research at a much earlier stage and to contribute ideas which align with their in-company, possibly civil, research programmes. Is the programme worthwhile? If so, does it need refining and how can it be improved?*

2.4.1. The concept of allowing private companies to gain access to and seek alignment with Defence Research activities, as under Pathfinder, is not new. For example, in the electronics area the Royal Signals and Radar Establishment (RSRE) played the leading role in fostering the advancement of UK industry in these critical areas of technology. Industry was slow to match the level of investment and was reluctant to take the risk of exploiting opportunities offered by expansion into civil markets. The situation is no different at the present time. Companies will only invest in technologies where there is clear evidence of pay-off in a few years. Even at the peak of the JOERS programme, where the MoD research establishments played a major role in supporting the DTI initiative, companies did not take advantage of the opportunity afforded. UK companies are at a disadvantage compared with their Japanese counterparts. They have to return a large proportion of the profit margin to their shareholders, significantly providing less capital for reinvestment (eg for research and new product development) than is typical in Japan.

2.5 *How does the DRA identify future defence needs, and is its method of identifying such needs properly thought out?*

2.5.1. DRA should identify future defence needs through consultation with MoD, its operational research branches and relevant sections of the armed forces. A close relationship is essential—DRA scientists will have a good understanding of the technical feasibility of future equipment and defensive systems.

3. The DRA's Relations with Industry, Europe and the Wider World

3.1 *Is enough being done to link the DRA's defence-orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?*

3.1.1. IPMS has argued for several years, including in submissions to Government and Select Committees, that insufficient priority is given to civil applications of defence research. Changing relationships between East and Western Europe underline the need for a change of approach. Cuts in UK defence spending confirmed in the 1993 unified budget mean that a strategy of diversification is now urgent. It is worth noting that ACOST, in its report "Defence R&D: A National Resource", put the blame for the lack of spin-off on the MoD and its refusal to take account of dual use potential when assessing R&D projects. This contrasts sharply with the experience of governments overseas, particularly the USA, which insists on military procurement having a civil spin-off wherever possible. ACOST found that technology transfer is best achieved where military and civil R&D take place within single organisations. The DRA has all the potential to achieve this objective. Indeed one of the DRA's specific aims in its framework document is to support the Government's overall environmental objectives. Yet it lacks the support and resources to develop this role. The cuts in defence expenditure are undermining its capacity to fulfil either its core remit or any broader activity. In the process highly skilled scientific teams are being disbanded with no strategy or mechanism for redeployment.

3.1.2. Civilian spin-off should be a major concern for Defence reserch. As commercial markets emerge, they will necessarily drive the advancement of technology. The Defence customer will benefit from being able to "run with the tide", gaining a considerable leverage from the level of investment made.

3.1.3. It would be best if spin-off was based on a long-term pursuit of profit for DRA (and possibly outside investors through the enterprise fund—if the accounting of profit could be handled). This approach would ensure that a properly commercial attitude was taken to spin-off (also see 3.5.1. below).

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

3.2.1. There are no clear recipes for the successful transfer of technology from the Defence to the Civil sector. Organisations such as DTE have failed, partly because of the hesitancy of venture capitalists to risk the prolonged incubation period between the time of product inception to its eventual demonstration. Japanese organisations have been successful in the exploitation of high technology largely because of their ability to take a long term view. In Japan potential new products are assessed some 15-20 years in advance of public release and plans put in place to research technology likely to be required for their realisation. Winners are established, unsuccessful technologies are dropped. The approach is successful partly because of a fundamental difference in the Japanese view of high technology, and also because greater emphasis is placed on a concerted effort involving government, industry and academia.

3.2.2. Government, particularly MoD and DTI, must be prepared to fund demonstation projects and similar activities which form a crucial stage in technology transfer where the costs and risks are often greatest and sufficient commercial funding will not necessarily be forthcoming.

3.3 *How does the DRA connect to the Technology Foresight exercise being conducted by the OST?*

3.3.1. The diversification of defence R&D, its intergration with civil objectives and its continued ability to meet the strategic uncertainties inherent in future military scenarios cannot be left to market forces. If an effective national strategy to strengthen and harness science and technology for the benefit of UK economic growth and quality of life is to be developed it must involve both civil and defence R&D. The MoD and the DRA must be incorporated fully into the Technology Foresight exercise and the Forward Look.

3.3.2. The Science White Paper points out in paragraph 4.12 that the DRA's Pathfinder programme is already providing industry with a greater knowledge of the work it is doing and how other organisations might become involved. While this should be encouraged it is also important to recognise the need for this to be a "two-way street", with opportunities also being offered to the highly skilled teams and facilities within DRA.

3.3.3. The White Paper has set certain objectives, modest though they are, for greater technology transfer, exploitation of the commercial potential of DRA's research, and greater collaboration with the civil sector. These must be fully activated and carefully monitored but the Government also has a responsibility to ensure that the targets, timetables and resources which are allocated to MoD and the DRA enable them to carry out these objectives effectively.

3.4 *How effective are the DRA's links with the DTI, and is there too little DRA involvement in the LINK scheme?*

3.4.1. The Institution has no comments to make on current links with the DTI and DRA involvement in the LINK scheme. However, since defence provides work for a major sector of the UK manufacturing base and since a major emphasis is now being put on civil linkages for defence research, links between DRA and DTI should clearly be strong. Indeed, both MoD and the DTI, who have shown signs of being semi-detached from the whole Science White Paper process, must be fully integrated within the whole government science and technology strategy and its implementation.

3.5 *Has the DRA effectively filled the void left by the demise of Defence Technology Enterprises, and is the DRA any more likely to succeed where DTE failed?*

3.5.1. Although the DRA has not yet filled the void created by the demise of DTE, it is ideally placed to do so. One of the keys to successful exploitation is to ensure an identity of interest and close co-operation between the R & D team and the exploiting organisation. DTE was certainly not helped by the hesitancy of venture capitalists to risk long term periods for product development. However unless a suitable financial regime is established, it may be fiscally more prudent for DRA to give higher priority to sources of revenue outwith the MoD, for example from consultancy work.

3.6 *What is to be the DRA's role in the issues of conversion and diversification in the defence industry as a whole?*

3.6.1. IPMS, along with other unions in the defence sector, has compaigned for the establishment of a properly funded Defence Diversification Agency (DDA) at the hub of a strategy to respond to the new industrial challenges following the end of the cold war. Locating the DDA within the DRA would allow a meaningful programme of diversification to be pursued. The DRA is uniquely placed to examine the wider applications of its own technology for commercial and industrial exploitation. It may also be in a position to realise the potential for forming partnerships between apparently disparate parts of industry, which otherwise may not have been considered. Strengthened links with the DTI could, at the same time, promote constructive dialogue with manufacturers on their needs and expectations.

3.7 *How should it relate to the part of industry which is not concerned with defence, and how much should it focus on dual-use research?*

3.7.1. The DRA has a broad overview of the capabilities of industry arising from its collaboration on funded programmes of work. In some cases the DRA may recognise the potential for forming partnerships between seemingly disparate parts of industry, which otherwise may not have been considered. The project team already established within DRA should enhance customer relations and help in promoting wider knowledge of the DRA's potential. In this area as much will depend on the effective use of human, as well as technical resources. Unless staff have broad and up to date experience of defence and civil applications gained by working on projects across the organisation they will not be in a position to contribute to technology transfer and opportunities for dual use research will be lost.

3.7.2. It may well be, however, that the current legal and contractual framework of DRA would pose some difficulties. If that is so, then the framework should be amended to facilitate such a focus.

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

3.8.1. Government policy on market testing and privatisation has at its root two simple assertions. These are that the private sector functions better than the public sector and that private companies must not be held back in competing for work done in the public sector. However, this simplistic view does not fit well with defence needs, as we have indicated above.

3.8.2. It is often assumed that the processes of market testing will reduce the cost of providing high quality research. Industry is good at manufacturing products and should not be encouraged to compete with DRA purely as a means of reducing the costs to MoD of carrying out a particular task. Some companies often submit bids on a loss-leader basis, knowing that they can increase the limits of liability at a subsequent time by negotiating a change in requirements, or details of specification. Emphasis should be on the continued development of partnership with industry, rather than enhancing the level of competition. There are already too many examples of failed programmes and over-run costs, and of claims arising from penalty clauses in procurement contracts as a result of work undertaken by inexperienced organisations. The costs of litigation outweigh any benefit arising from the initial competition.

3.8.3. On the problem of securing a "level playing field" both within the UK and particularly between the UK and EC research organisations in the awarding of research contracts, under the new EC procurement directive, any tenders by public "customers" for "Scientific services" and "R&D", above a certain value will need to be open to "contractors" throughout the EC. This will be unfair to UK contractors in at least two ways. Firstly, the funding structures are different so that, for example, public research establishments in Holland will be able to underbid for UK contracts because they have different "accouting" rules and have subsidised energy and rent. Secondly, UK public research funders and providers will be forced to put contracts out to tender among other member states when the structure of research organisations in those other states, especially in France and Germany, is such that UK research organisations will not be able to bid for their research to anything like the same degree. This problem will increase if the process of competitive tendering for research in the UK accelerates and the EC extends further into the defence/civil interface. (see question 3.9 below). Moreover, many EC research grants are provided on the basis of tripartite collaboration. If a large number of GREs are privatised then the UK competition for contracts will grow but the ability for tripartite bids to include a government partner will diminish and the UK may as a result lose contracts to Europe where more R&D and scientific services remain wholly within the public sector.

3.8.4. The DRA approach seems very sensibly to be to take one step at a time, which seems to have been successful so far. There is no reason why, with goodwill on all sides, this should not continue successfully. This is another area where DRA's status within the Civil Service helps. Industry accepts that the DRA staff take their obligations as civil servants very seriously indeed.

3.9 *What kind of relationship exists with the EC Framework Programme and other European (including non EC) programmes, such as EUCLID and EUREKA?*

3.9.1 The Treaty of Rome deliberately gave the European Committee no defence role but the single European Act is more ambiguous in that Article 30 gives the EC the responsibility to "maintain the technological and industrial conditions necessary... for security". Any steps in that direction, however, face the difficulty that EC membership does not wholly coincide with military alliances. It is also interesting to note that the recent Cabinet Office publication on "The Impact of European Community Policies for Research and Technological Development upon Science and Technology in the UK" (HMSO July 1993) makes barely a mention of defence R&D.

3.9.2. However, if a closer relationship between military and civil research is developed, and since DRA has to find an increasing proportion of its income from non MoD sources, this area of potential collaboration and support must be addressed. Particularly also as the escalating costs of high technology defence and the downward pressure on defence budgets in all European countries makes collaboration and cost sharing even more crucial. Also the increasing shift of the EC Framework Programme towards wealth creation objectives means that the defence sector can no longer afford to keep its distance.

3.9.3. In pursuing this issue in more detail the House of Lords Select Committee will also need to pay attention to the continuing problems of "attribution" to which it has already addressed itself on several occasions. In this context, the Cabinet Office document on EC programmes mentioned above has several important observations to make about the practical adverse impact of that policy on government departments' and others' research programmes.

3.10 *Does the DRA seek European collaboration as a matter of course?*

3.10.1. DRA considers European collaboration as a matter of course through programmes such as EUCLID, EUREKA and through organisations such as ESA and NATO. There are specific projects with our European partners, for example with France on missiles, but the main focus of defence collaboration is currently with NATO allies.

3.11 *Is there in other countries anything relating to the management of defence research from which the United Kingdom could learn?*

3.11.1. The former MoD research establishments were looked upon as models for other nations to follow. For example, staff within US Defence laboratories frequently commented on the efficacy of the UK organisation. The DRA has set itself the objective "To be the Government owned research and technology organisation that is most commonly quoted as the benchmark in all western nations for responsiveness, efficiency and quality of work and thus to be a source of pride to our owners, our customers, and our staff."

3.11.2. That is not to say, however, that the structure and funding of defence research in the UK does not leave much to be desired. The Institution attaches importance to the statement by ACOST that "It is a central tenet of policy just about everywhere, except in the UK, that separate development of military and civil technology is neither practicable nor desirable." In the USA, for example, President Clinton has put increased emphasis on co-operative research involving government, industry and academic expertise, development of centres of excellence, use of materials from domestic sources, conversion and dual use, military superiority and environmental acceptability. The Defence and National Laboratories are expected to form a focus for such activity. In France, work is well co-ordinated by government, with some work carried out at government funded laboratories. However, national funding is also provided to support research programmes by industry. This has resulted in successful follow through in certain areas of work, despite a slow start in comparison with the UK. In Australia, an Industry Support Office has been formed within the Defence Science and Technology Organisation to ensure that DSTO innovations with potential outside the defence area are nurtured. So, although there is no single model, initiatives with similar objectives are being progressed in countries that are also facing cuts in defence spending. By contrast, the DRA certainly faces a major task in challenging and changing the established culture in the UK.

January 1994

Memorandum by the Manufacturing, Science and Finance Union

MSF AND SCIENCE

Manufacturing Science and Finance (MSF) is a multi-industry union spanning the public and private sectors with over five hundred thousand members. The union was formed as a result of a succession of mergers in the trade union movement. One of our predecessor unions was the Association of Scientific Workers (AScW) which was largely responsible for placing the general importance of science onto the agenda of the national trade union movement.

The AScW was part of the merger that formed the Association of Scientific, Technical and Managerial Staffs (ASTMS) in 1968. ASTMS continued developing policy in the area of science and worked with the Association of University Teachers (AUT) and Institute of Professional Civil Servants (IPCS) in the Alliance for Science.

ASTMS in turn merged with TASS in 1988 to form the MSF. The new union brings together scientific workers in universities and professional scientists and engineers in industry, we also have scientific membership in the National Health Service and Research Council field. Because MSF also has a large membership in the finance sector we can bridge the gap between innovation, development, investment and marketing. With an estimated one hundred and twenty thousand members engaged in science, R&D and transferring innovation to marketable goods and services, MSF is organised in many of the key areas of the next generation of scientific and technological advance.

MSF IN THE DEFENCE RESEARCH AGENCY (DRA)

MSF would like to thank you for the opportunity to submit evidence to your enquiry. We are a minority union in the Defence Research Agency (DRA). Our membership covers skilled craft grades. MSF negotiates for managers, engineers, scientists, technicians and craft employees in all major defence suppliers.

MSF has a close working relationship with the IPMS on defence and scientific matters. Our unions were joint sponsors of a motion on science policy at the 1993 TUC Congress.

1. THE DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH THE MoD

1.1 *How independent of the MoD is the DRA?*

Whilst the establishment of trading fund will move the DRA towards greater administrative independence, the DRA is highly dependent on the MoD for its funding (presently roughly 90 per cent). In turn, the MoD is highly dependent on the DRA for high quality advice of a specialised nature.

1.2 *Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

1.3 *How does the DRA's status affect its research strategy?*

There are both benefits and costs with the move towards trading fund status. Our main cost fears are that market pressures may cause the managers of the DRA to downgrade longer term research in order to produce "results now". Already there is too much pressure in this direction in the UK. MSF warned of the pressures of short-termism in our policy statement *"Science for Britain"* and in our response to last year's Government science white paper.

Purely market led solutions misunderstand the nature of scientific enquiry and discovery. Many scientific breakthroughs are produced as a result of longer term research of a speculative nature.

MSF also fear that managers seeking to improve the notional profitabilty of the DRA will reduce staff levels and seek to drive down the relative level of renumeration for those remaining in comparison with the private sector. This will result in the loss of on-going research, the break up of research teams and the eventual loss of expertise.

The pressures on the DRA are very great. As explained in the answer to 1.1 the Agency is highly dependent on MoD work. But the MoD is a declining market. Finding alternative work will only partly offset this decline and the future cohesion of the DRA will be highly dependent on the Government seeking to define an additional role for the DRA if we are to avoid the dissipation of experienced research teams. MSF has argued for nearly a decade that the UK needs a Defence Diversification Agency (DDA) to assist in the transfer of defence production into civil markets. The DRA is obviously an embryo for such an agency. This is a position that we expand on later in our response.

1.4 *How has the MoD's system of Research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading fund Status?*

MSF has no view on this question.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

1.6 *How is the process of formulating a strategy for the DRA being affected by the new thinking about the defence and foreign policy, following the end of the Cold War?*

The DRA's new status could threaten its reputation for impartial advice unless balanced by other measures to maintain this role. Commercial considerations may be the driving force rather than scientifically sound advice. Fears have also been expressed by private industry that the DRA may become a potential competitor or be taken over by a competitor.

The question of whether the new status will help the DRA meet the Government's policy direction will ultimately depend on how the Agency maintains the balance between its new commercial direction and its role in providing impartial advice to the Government through the MoD.

The changing international climate and widening role for the United Nations and other cross-governmental organisations will require continued research for the DRA. The demise of Soviet Union has not seen the establishment of a new world order but a new world disorder based on regional conflicts. These have brought a new instability to international affairs. Parallel to this process has been the development of new kinds of smart weaponry which can give the country an advantage over numerically superior adversaries.

Defence policies are now being based on the concept of a flexible response based on a full time, highly trained defence forces, equipped with the latest high tech weaponry. This needs higher levels of planning and cannot be driven by market forces alone.

1.7 *The DRA, like its predecessor organisations, has as its primary role the provision of research services to the MoD. In the past, however, the defence research establishments have also provided other (non-research) scientific and technical services to the MoD (significantly so during the Falklands and Gulf conflicts), as well as to other Government departments and private customers. How far should the DRA continue to provide such services, and to whom?*

The extent to which the DRA should provide scientific advice to private customers should be based on wider questions of the nation's security requirements. This we would advise could be the basis for further enquiry. However, the important question is the correct balance between its primary role and role in supplying other services. This balance should be commensurate with a capacity to continue to supply the nation's defence needs particularly in a time of emergency.

2. The DRAs Management, Internal Affairs and Corporate Strategy

2.1 *Will planned restructuring and rationalisation affect excellence or will it succeed in helping the DRA meet its new budgetry challenges without hindering quality?*

It is the view of all the unions in the DRA that the planned restructuring and rationalisation will certainly affect excellence. Some of the management have confused total quality management with quality research. Whilst TQM has in some cases been successfully employed in the manufacturing sector, its appropriate application to high tech research has not been scientifically tested. Many of the performance standards may prove to be too rigid, restricting innovation, and in addition, they run the risk of introducing additional bureaucracy.

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting-up of the Agency?*

2.3 *What are the implications for the new regime's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to change?*

MSF would suppose that the rationalisation is a logical consequence of the move towards agency status, which is in turn a logical consequence of the Government's attempts to reduce public expenditure and commercialise the public services. However, MSF members in the DRA believe that the pace of rationalisation is too fast, with poor communication and consultation about the proposed changes and their likely effect with the workforce. Staff therefore fear for their future employment and the long term viability of the DRA in any manner resembling its present form.

This is compounded by the problem of pay, which in the public sector compares unfavourably with similar employment in the private sector. Previously, employees could be partly compensated for this difference by the knowledge that employment was relatively secure and they were providing a public service. The move towards Agency status has undermined this position.

Initial indications reveal that the pay system in the DRA will differ radically from that in the MoD. This will not assist in interchange between the two organisations. In addition, management is proposing to link pay to individual performance. Surveys, including one recently undertaken by MSF, have revealed that such performance based pay systems create anomalies and actually demotivate staff.

In some senses we are unable to answer directly question 2.3 in the shadow of the last recession and in an atmosphere of public sector pay restraint and high unemployment. However we believe that a sustained recovery in the UK economy will result in many skilled personnel seeking employment elsewhere.

2.4 *Pathfinder is the DRA's programme to allow private companies to gain access to research at a much earlier stage and to contribute ideas which align with their in-company, possibly civil, research programmes. Is the programme worthwhile? If so does it need refining and how can it be improved?*

MSF welcomes programmes like Pathfinder which assist in developing civil applications for defence research projects. However Treasury restraints on MoD expenditure is reducing the scope for the wider application of the Pathfinder programme. In addition the defence industry has proven slow in investing sufficiently to expand the effect of the programme.

2.5 *How does the DRA identify future defence needs, and is its method of identifying such needs properly thought out?*

This can only properly be done in consultation with the MoD, based on a realistic military "threat assessment" rather than the grandiose policies of the past, underlining the need for continued and close cooperation between the two organisations, which we hope the move towards Agency status will not undermine.

3. DRA's Relations with Industry, Europe and the Wider World

3.1 *Is enough being done to link the DRA's defence orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?*

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

3.3 *How does the DRA connnect to the Technology Foresight exercise being conducted by the OST?*

3.4 *How effective are the DRA's links with the DTI, and is therefore too little DRA involvement in the DTI's LINK scheme?*

3.5 *Has the DRA effectively filled the void left by the demise of Defence Technology Enterprises, and is the DRA any more likely to succeed where DTE failed?*

3.6 *What is to be the DRA's role in the issues of conversion and diversification in the defence industry as a whole?*

3.7 *How should it relate to the part of industry which is not concerned with defence, and how much should it focus on dual use research?*

MSF has argued for nearly a decade that insufficient resources have been given to civil applications of defence research. The time of stable defence markets would have been an ideal opportunity to develop a strategy for diversification. But both industry and Government acted with some complacency.

The country is now in a situation where policies in key areas such as defence research are being shaped by world events. Changing international relations underline the need for a strategic approach, rather than the laissez-faire approach which dominates Government actions in this area. Government and industry funded defence R&D is now declining. Industry financed defence R&D declined by over eight per cent in the period 1991–92 alone. The primary case that we wish to make is that the DRA is a unique national resource. A highly skilled team of defence research, technical and other support staff based in the public sector.

Without Government action we could face the unstructured rundown of this national resource, precisely when part of the role of the DRA could be redefined and expanded to help the nation meet other industrial needs.

MSF has long campaigned for an expansion of this nation's manufacturing capacity. We believe that our economy is "out-of-balance" between the manufacturing and service sectors and this brings about cyclical balance of payment crises. In addition, a large proportion of our manufacturing capacity is based in the defence sector. This sector is competing in declining markets.

Likewise MSF has long argued that we do not invest enough in R&D and our science base. Once again a large proportion of this investment is based in the defence sector. Of the OECD countries, only the United States and France spend more or a similar proportion of their GDP on defence R&D.

The essential question for MSF is how the nation can maintain manufacturing and R&D capacity and diversify in this sector. Along with our colleagues in the IPMS and the TGWU, MSF called for the creation of a Defence Diversification Agency (DDA) in our joint statement: *"The New Industrial Challenge—the need for defence diversification"*.

Trade unionists are keenly aware that such a simple transfer of resources could not take place without imposing great hardship on those defence workers whose skills could not transfer easily into areas outside manufacturing. In addition, the opportunity to put military technology to alternative use would be lost forever as potentially productive plants closed down. The term "arms conversion" has therefore come to be associated by defence workers with job losses and industrial decline.

For these reasons this publication uses the term "defence diversification" to make the argument that the first call on resources taken from defence manufacture must be manufacturing.

Many ideas have been put forward in the debate on defence diversification but few practical results have been achieved. But there are growing signs of a change in attitude among senior managers in large defence companies who see the future prosperity of their companies tied up with the need to diversify.

MSF and other unions have drawn up practical proposals for the structure and operations of a Defence Diversification Agency (DDA). The main points include (see also Appendix 1 *[not printed]*):

- *Product planning*—assessing the technological and manufacturing strengths of the enterprise and the identification of new markets and products.
- *Marketing*—the provision of independent advice. The managements of the defence companies have little knowledge of the commercial markets.
- *Research and development*—the DDA could acquire the skills and experience of scientists and engineers who would work closely with those already in the MoD and the industry to develop new technologies required. It would also act as a "clearing house"—single point of contact for enterprise wishing to diversify.

- *Training/Re-training*—the DDA would develop retraining packages for defence employees.
- *The Regions*—relationships would be established with local government, universities and the Training Enterprise Councils (TECs) in the heavily defence dependent areas.
- *DDA Structure*—The unions did *not* envisage the DDA as a highly centralised, bureaucratic body. It would, however, include staff with expertise in policy and administration, and liase with the various government departments, particularly the MoD and DTI, the City, training agencies, trade unions and the EC.

The role of Government and the public sector is crucial to the success of any alternative strategy. The need for planning to effect changes in production is paramount, because of the impact across geographical and industrial sectors, long term investment and retraining will be needed to effect change on the scale required. This can only be accomplished successfully by agreements between all sides of industry. Companies will need new markets, incentives to produce alternative products and customers to buy them. Employees will need some form of guarantee on continued employment.

Faced with the immediate threat to about 25 per cent of the UK engineering industry and a massive loss of skills, the Government has replied, when questioned, that the companies should seek "new opportunities". The mystical belief in market forces causes extreme exasperation amongst senior defence industry managers because they know, as does the MoD, that the free market has never played any significant part in the buying and selling of military equipment.

The Government has selected the potential enemy (not always accurately), ordered the weaponry, paid for the R&D and often acted as a marketing agent for overseas sales. All post-war UK Governments, including Mrs Thatcher's, have intervened in the defence market far more than in any other area of British industry. The companies, having had the high defence spending cushion removed, find themselves without the right management, products, marketing expertise or knowledge to face the commercial world.

The UK's military partners, who are also our commercial competitors, have the advantage of having a public stake in many of their leading defence contractors. Successful diversification is no easy option. But if seen as necessary and the correct strategy is employed to bring it about, massive job losses and widespread cutbacks are not inevitable.

An important component of UK defence expenditure is R&D. Whether it takes place in industry or within MoD, R&D contributes to the nation's scientific base and can produce important spin-off for civil applications. The microchip is just one example of a technology development for military use which has revolutionised our working lives.

The level of defence R&D is as important as the level of overall defence spending for the ability of British industry to adapt to a changing world. It is through R&D that technologies with both civil and defence applications will be developed. Historically, the UK Government's expenditure on defence R&D has amounted to approximately half its total spending on R&D.

It is clear that, as MoD increasingly passes risk onto its suppliers—both in its procurement policies and in its support for R&D—those companies will be less able to adapt to the smaller home defence market of the future and ultimately will be unable to provide a secure source of supply.

It has long been recognised that the extent to which military technologies spin-off into civil applications is low by comparison with the apparent wealth of opportunities. In this area, as so many others, the UK has a worse record than our competitors.

Put simply, this failure represents a waste of scientific and technical expertise which could be put to the nation's economic advantage. However, the need for improved spin-off takes on a special urgency if the defence sector is to survive through diversification into civil work. It represents the cheapest and least disruptive way of employing existing skills, knowledge and resources in non-defence work, while retaining them for the defence work that will continue to be required.

In 1989, the Government's Advisory Council on Science and Technology (ACOST) addressed the lack of spin-off in its report *Defence R&D: A National Resource*. ACOST found that:

- less than 20 per cent of the MoD's research and development effort has spin off potential;
- much of this potential is unrealised;
- the UK is less successful than some other countries in bridging the military-civil divide, largely because it has inadequate institutional arrangements to encourage cross-fertilisation.

The report put the blame for this firmly on MoD and its refusal to take into account spin-off potential when assessing R&D projects. As ACOST noted, this is in stark contrast to our ecomonic competitors who seek to gain wider benefits from their defence R&D expenditure. In other countries "Defence spending is recognised as a technology driver and the relationship between defence and civil technologies is deliberately exploited both by Government and industry".

ACOST made a number of recommendations, many of which have increasing relevance as the defence sector seeks to diversify its activities. The Council's main point was that "MoD should utilise its research and contractual procedures . . . in ways that take greater account of the nation's future technological capability, principally by encouraging investment in a broader national technology base for defence from which both defence and civil sectors may benefit".

The measures needed to achieve this include:

- greater participation with industry and other Government departments in developing enabling technologies identified as having both military and civil applications;
- restructuring the MoD research establishments so that the department's enabling science research is carried out within national centres of excellence serving both defence and civil markets;
- awarding greater numbers of R&D contracts at the enabling phase to those organisations with proven technology transfers mechanisms;
- formulation of R&D contracts in ways that positively stimulate civil exploitation of defence technologies.

The Government's response to this report was not heartening. Although in agreement with its main objectives—effective provision of defence technology with optimum cross fertilisation between military and civil sectors—the Government felt this was best achieved "through the operation of market forces in an environment of competition, with carefully targeted public sector support at the pre-competitive stage".

In the Government's view, the MoD has no role in wider science and technology policy, nor should it seek to have such a role. The inconsistency between the Government's objectives and its ideology is demonstrated in this startling contradiction in its response to ACOST:

> "The Government does not see the defence budget as having an industrial sponsorship role or a responsibility for technologies unrelated to defence needs; that would lead to muddled roles and inefficiency.
>
> The Government agrees that rigid segregation of defence from civil research is in principle undesirable and wishes to see the benefits of cross-fertilisation especially in enabling technologies".

This contrasts sharply with foreign Governments, particularly the USA, who insist on military procurement having civil spin-off whenever possible. The problem is that ACOST found that cross-fertilisation—or technology transfer—is best achieved where military and civil R&D take place within single organisations. Yet the over-rigid separation of Government funds and research establishments prevents this from happening. Similarly, in the private sector, suppliers are generally either purely defence suppliers or have quite separate and distinct "defence" divisions. This is in large part due to MoD's tight rules on secrecy.

In the changed Europe of the 1990s, MoD should focus its R&D spending on enabling technologies, with development evaluation systems to assess the degree of cross-fertilisation achieved. The programme to assist suppliers to diversify should be co-ordinated by a diversification body. After years of encouraging suppliers to rely on MoD, that is the least the Government can do.

Whilst there are no ready made formulas for the successful transfer of technology from the defence to the civil sector the DDA will also facilitate this process. In addition MSF has always identified "short-termism" in the provision of investment capital from financial institutions as another major constraint in this process because the sucessful exploitation of technology needs a longer term approach.

MSF believes the DRA should be fully involved in the Technology Foresight exercise being conducted by the Office of Science and Technology (OST). This was established in last year's Government Science White Paper. Whilst MSF expressed the belief that this was too weak an apparatus to effectively give strategic direction to the nation's science and technology efforts, we also recognised that this exercise marked an interesting departure from past Government policy. However this process should not be a "top down" process.

In addition, the links between the DRA and the DTI should be strong. MSF believes that the DTI has developed a wrong sense of priorities for its work, over concentrating on issues of deregulation and competition policy, as opposed to prioritising the building of a strong industrial base in the UK. We also sensed a luke warm attitude towards the Science White Paper. Indeed we believe that the white paper was a compromise between the DTI and the Minister for Science which greatly weakened its objectives.

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

The Government has too often held a simplistic view that the private sector is a more efficient provider of higher quality services. MSF has long opposed this viewpoint and this has particular relevance in the field of defence. We would hope that the move towards to Agency status is born out of a genuine desire to improve the quality and effectiveness of the work of the DRA.

However, competition between the public and private sector has previously been used as a device to drive down costs through eroding the employment and living standards of those working in the public sector. Private sector businesses have in the past underbid to secure contracts or provided greatly inferior quality of service. This has often resulted in torturous renegotiation of contracts or litigation. Whilst this may provide welcome work for a number of professions, it ultimately adds to business costs and hardly advances the nation's defence research work.

3.9 *What kind of relationship exists with the EC Framework programme and other European (including non EC programmes, such as EUCLID and EUREKA?*

3.10 *Does the DRA seek European collaboration as a matter of course?*

The DRA is involved in EUCLID and EUREKA. The main focus of European collaboration work is through NATO allies.

European Community wide collaboration on defence research should become increasingly important. This is one way to address the increasing costs of defence research. In addition through the EC Framework Programme may provide an alternative source of funds for the DRA. However in the past the Treasury has practised "attribution", where funds received from the EC are offset against national science expenditure. This practice has been criticised by previous House of Lords enquiries.

3.11 *Is there in other countries anything relating to the management of defence research from which the United Kingdom could learn?*

MoD research establishments are held in high regard in many parts of the world. However it is now recognised that there is a need for more organic links between defence and civil R&D, if we are to fully benefit from any potential transfer of technology. These links already exist in some other countries and the Clinton Presidency is examining how such links can evolve in order that the United States can exploit its massive investment in defence R&D. In our contracts with trade unions in other developed countries we sense that they place greater emphasis on R&D and have a strategic sense of the need to maintain defence based research teams and research capacity in the changing international climate.

January 1994

Memorandum by the Defence Research Agency Industrial Trades Unions Consultative Committee

2.1 *Will planned restructuring and rationalisation affect excellence, or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?*

The planned restructuring and rationalisation concentrates on keeping core activities in-house and contracting out support facilities. We believe that the new budgetary challenges will lead DRA to accept the lowest price quoted, a price often arrived at by the production of work of a lower standard. There is a difference of opinion between the unions and management on whether the support facilities should form part of the core activity. If current negotiations with management were to be succesful, some support facilities would remain in-house and standards would not be lowered. We believe this could be achieved within the new budgetary guide lines and see no point in using the rationlisation budget simply to cover the compensation payments necessary for a reduction in manpower. The current workforce contains many skills and years of experience that, if lost, would have disastrous consequences not only for the future business of DRA but also for the country. It is our belief that the skills which the current workforce possesses are a national asset and should be valued as such.

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting up of the agency?*

These two statements do not offer a choice: they cover totally different concepts. Once the DRA was set up, rationalisation could not be avoided and was obviously a logical and necessary consequence. However, it has been carried out too quickly to allow the staff concerned to adapt it. People who have in the past had no experience of, for example, managing budgets, are now having to cope with work totally new to them with little training and no time to absorb and adapt to their new responsibilities. As a consequence of this, they are inclined to err on the side of caution which is not always beneficial in a research environment. Some research projects may not be undertaken as a result of this because the cost of the research cannot be predicted.

2.3 *What are the implications of the new regime's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?*

The pay and grading structure which is currently being negotiated with the trade unions could be a great bonus to the new regime. We are hopeful that it will offer a system that can be seen to be fairer and simpler than the present one and to reflect the change in the organisation. There are many areas where the old pay systems suppressed potential achievement. Promotion was sometimes seen as a retrograde step because it was possible that despite higher status you could be on a lower rate of pay. With the ability to set its own salary level the DRA should be able to recruit the best staff.

There have always been procedures to follow in personnel matters but these procedures are negotiable and any staff not capable of performing their jobs to the standards required can be shed.

2nd February 1994

Examination of Witnesses

Dr V Ellis, Assistant General Secretary, Mr R McDowell, National Officer, Dr N Peeling, Member, DRA Malvern, and Mr W Wildash, Senior Scientific Officer, DRA, Portland, from the Institution of Professionals, Managers and Specialists; Mr T Webb, Assistant General Secretary and Mr C Jordan, Member (DRA), from the Manufacturing, Science and Finance Union; and Mr S Clarke, DRA, from the Amalgamated Engineering and Electrical Union, called in and examined.

Chairman

241. Good morning. We are grateful to you for joining us this morning and for helping us with our enquiry. First, would you like to introduce yourselves?

(*Dr Ellis*) I am Valerie Ellis, Assistant General Secretary of the IPMS.

(*Mr McDowell*) I am Ron McDowell. I have special responsibility in the IPMS for membership at DRA and also the Ministry of Defence.

(*Dr Peeling*) I am Nick Peeling from DRA Malvern. I have been advising the IPMS headquarters on their submission.

(*Mr Wildash*) I am Willie Wildash from DRA Portland. I am also Chairman of the DRA staff side for IPMS.

(*Mr Webb*) I am Tim Webb, Assistant General Secretary of MSF, responsible for the membership in the defence sector.

(*Mr Jordan*) I am Colin Jordan of MSF, shop steward, Farnborough, DRA.

(*Mr Clarke*) I am Sean Clarke. I am employed by the DRA and Vice-Chairman of the Industrial Track Committee.

242. Perhaps I could first start with a general question. I wonder whether you would like to tell us how you see the new arrangements in the Ministry of Defence and the DRA in general terms?

(*Dr Ellis*) The single most important effect of the new relationship between the MoD and the DRA is that it has sharpened the customer-contractor relationship. The ability of the MoD customers to choose what they fund has initiated many positive changes in the DRA's attitudes and behaviour. We think that change has led to increased customer satisfaction from the point of view of the MoD. The crucial importance of the customer-contractor relationships is that there must be an intelligent customer on the customer side, otherwise the situation will not work. The Ministry of Defence will not get the right advice and the right research done. That, in our view, also depends on the degree of interchange and close relationships between the customer and the contractor. So the current Government's ideology of total institutional separation of customer and contractor would be disastrous for the Ministry of Defence and its research establishments.

243. In your evidence at paragraph 1.5.4 you make the point that "The current government pressure to compartmentalise ... will greatly hinder the free flow of people and ideas". You go on to say that "In the real commercial world good 'customers' take the trouble to cultivate and establish close links with 'suppliers' [and] do not normally 'shop around' at arm's length". Could you elaborate on those reservations that you have?

(*Dr Ellis*) In the type of work that the DRA is doing and the MoD requires, there are not that many contractors who actually can have the range of expertise, the intellectual capital or the physical capital to be able to give advice to the customer. Because of the huge cost and the type of research work in which they are involved, the DRA at the moment is the seat of most of the expertise that is required for the MoD as a customer. If the DRA was totally cut off from the MoD whenever the MoD was contracting out work, because the DRA was a potential contractor that, we think, would lead to an inferior quality of advice and not very good decisions on the specification of the contract or on which contractor should do it. But perhaps my colleagues can add to that.

(*Dr Peeling*) The competition is primarily being used to prove that that the DRA is competitive in cost. So the separation in competition is primarily to establish that the value of the work that the DRA is doing is at least as good or better than in industry. But in many relationships which, for example, are called things like the Marks & Spencer's trusted relationship, the customer and the contractor are dependent upon each other. Therefore there tends to be a physical interchange of staff between the two companies. The MoD in that situation puts staff in the DRA and the DRA seconds people to the MoD, because there is an appreciation that a close understanding of the customer's needs by the contractor and the contractor's needs by the customer is necessary to give them the closeness of the relationship DRA and the MoD want. So there is a very fine dividing line as to the level of separation that is desirable to the MoD. At the moment that causes worries, for example where there is a divergence in conditions of service of staff between the MoD and the DRA, that this may put impediments in the way of interchange of staff. Currently it is okay, but people are worried that further changes towards separation might damage that relationship.

(*Mr Webb*) Perhaps I may add to that. The relationship between the MoD and the defence suppliers is not always a happy one. The increasing distancing of the DRA from the MoD we hope will not lead to the kind of cultural differences that exist between the MoD and the suppliers. Very often the difference of emphasis and the kind of monitoring

[Chairman *contd.*]

that the MoD exercises over the suppliers is not always as tight as it could be. Because the suppliers have very often done their own thing to some extent, as has the MoD which is responsible for carrying out the policy of the Government, there have been in the past major fiascos such as the cancellation of the Nimrod early warning system, where both the suppliers and the MoD blamed each other. They both said that the right hand and the left hand were not working together. So we can see dangers of pulling apart the DRA and the MoD in a cultural and technical sense.

244. So do you see a degree of interdependence between the MoD and the DRA which is threatened by these arrangements?

(*Mr Webb*) Yes, that could be the case. There are dangers there, certainly.

245. Do you see that as a trend which is continuing? Or is it a situation whereby the new arrangements have moved one step and it has now stabilised?

(*Mr Webb*) To be honest with you, I think it is a trend. It is not just in this field either. The increasing commercialisation which is necessary to some extent does in fact drive a wedge between two obviously relatively close parties.

246. There have been a number of people who have given evidence to us who have said that in the light of the changed priorities for defence research and the changing brief for the Defence Research Agency, it has clearly been necessary to restructure and rationalise a number of sites and to have a greater degree of accountability. Would you accept that those attempts to increase the efficiency of the assets is a sensible and indeed desirable objective?

(*Dr Ellis*) Certainly the objective is sensible and we would agree that eventually hopefully the strategy that the DRA is pursuing with the efficiency gains will outweigh the problems of change. The point that was being made in our evidence regarding our scepticism about whether the rationalisation was working was not so much questioning the rationalisation strategy but some of the mistakes that have been made, and some of them could have been foreseen, in actually implementing that strategy. We hope and now believe that the DRA will eventually get it right. But there have been several cases—and you will be well aware of them—like the accounting system where in fact they have changed their policy and moved to a system along the lines which IPMS was advocating in the first place. There is also a hint in the question that because of rationalisation and because the strategy that the DRA is pursuing is the right one in general, everything they are doing in the process of getting there is right. This is one of the major problems—that the pace has been very fast. Some of the criteria that have been set by the Treasury—often conflicting criteria set by the Treasury—and by government policy, such as the introduction of market testing and asking the agency to work as an independent organisation and sort out its own problems but at the same time to have market testing because that happens to be the government policy, that sort of confusion has not helped the process. You will know from the recent report of the Public Accounts Committee on the proper conduct of public business that there is major concern in a lot of areas where these changes have been taking place far too rapidly and without sufficient attention to details and to professional advice and to the type of organisation one is working with.

Lord Dainton

247. What you have been saying seemed to me—please correct me if I am wrong—to be criticisms of the management of the change rather than criticisms of the direction of the change and its ultimate destination. Have I understood that correctly?

(*Dr Ellis*) Yes, certainly management in the broad sense. But that would also include the criteria to which they have been asked to work. We are not necessarily criticising the management staff in the DRA. We feel that they have tried their best in very difficult and pressurised circumstances.

248. So you expect the situation ultimately to settle down, do you?

(*Dr Ellis*) We would hope so—with the right training, experience and really understanding the nature of the DRA as a particular type of organisation and not trying to apply precisely the same timescales and precisely the same rules to every agency, which is what the Government tends to be doing at the moment.

Lord Howie of Troon

249. When you say that it is expected to settle down, do you mean that the management will be able to cope with whatever burdens are put upon them by the Treasury and such like, but that you would hope that the Treasury would behave in a slightly different way? Is that it?

(*Dr Ellis*) Yes, that is one of the things that would certainly help. The DRA would be seen by the Treasury as a distinct type of organisation.

Baroness Hilton of Eggardon

250. Pursuing the problem of rapid change, you comment in several places about the low morale of the staff and its consequences. Do you see that as something that will be overcome in due course when things settle down? Or do you think that the effect of the new set up is that morale will continue to be low?

(*Dr Peeling*) When we say "settle down", we do not mean that the change ceases. In the new organisation that is being created change will be perpetual. What you must get is an organisation where change is so professionally implemented that it does not cause many graunching noises in the machine. There have been an awful lot of graunching noises from the machine in the past two years; in the past six months considerably less than in the 18 months previously. DRA management is saying to the staff that they anticipate another year of very rapid change and thereafter they hope that the changes will be able to be effected without serious morale impacts on the staff. I think that there is a recognition in the DRA management that morale has dropped. I think that with the rapidity of the change, even with the world's best management, morale would have dropped.

[Baroness Hilton of Eggardon *contd.*]

Unfortunately there are never enough good people to implement change. It has stretched some people probably beyond their capabilities, even though I think the team that was implementing it was quite likely above average quality. There is now some hope but there is no proof that everything will be okay. After a period of pain one becomes sensitive to pain.

251. We have had some conflicting evidence that clearly some people, in talking to people in the DRA, have found people who were stimulated and excited by what is happening. What levels of staff are we talking about and what is your evidence that morale is low throughout the organisation?

(*Dr Peeling*) It is not a level of morale. If you look at me, the right hand side is stimulated and the left hand side is depressed. I think that there is a mixture of elation and depression. At the worst of times, for example when the commercial accounting system was coming in and the DRA cost estimating tool was falling apart, I think that you would have found few people whose depression did not seriously outweigh their elation. So it is not a uniform picture. But certainly if you just walk round the establishment talking to people you will get a mixed story. I think that morale is rising. It has bottomed out. Whether it will get back to the same high levels as before the change is in management's hands.

Lord Craig of Radley

252. Following on from that, clearly with the very significant changes in defence all around—major reductions, *Options for Change* and further defence projects—even if the DRA had not gone to a changed status, I think inevitably there would have been a knock-on effect down to the old research establishments as a result of those very significant strategic changes in the world scene and the Ministry of Defence budget. Could you measure in any way in your mind whether the concerns that have been expressed (and I understand them) are very different from those which might have occurred anyway if the DRA had not been formed and there were going to be significant budget changes and so on in the old research establishments?

(*Mr Clarke*) Perhaps I could come in on that. I think that speed is one of the things that has caused this effect and the lowering of morale. One of the biggest problems is that our people are conscious that the work is still there to be done. But the main thrust of the organisation is to contract out what they say are non-core activities. We believe that a lot of the tasks that are performed, certainly by the industrial workforce, are core activities. They always have been in the past. The devolvement of the engineering services sector now, which is the latest thing that we are having to deal with, is about to create redundancies—up to 470 redundancies. That was a group of people who, over the past 12 months, accepted the rationalisation brought about because of the coming together of the four old research establishments and the formation of the DRA. So in that first 12 months of rationalisation there was a lowering of morale. Everybody knew that that was to achieve the sort of cost savings that we had to make in order to be competitive. But then, just after we had gone through that exercise, the decision was made that we would no longer market test engineering services. It would just be development. We know that there is still a lot of work to be done. We are informed that there is a lot of work to be done. It is just that it is going to be done by contractors. We cannot get over the problem of people coming to us and saying, "Why is it? I have been doing this job for the past 10, 20 or 30 years"—and we had a chap retire last week who had been there for 51 years - "and all these years I have been giving service to the organisation and to the country, and now I have just been thrown out and the work has been given to a contractor?" We cannot seem to breach that. We cannot get over it. We do not know the answer to give to the staff. We certainly cannot answer the question. We do not think that the management of DRA can either. It is purely cost driven.

(*Mr Jordan*) That is the feeling and the morale on the shop floor end from the industrials. They are dismayed and depressed. They cannot understand why you want to lose such a facility when you have had such great responses for the Gulf and the Falklands. It is the same people who are being made redundant. We feel that it is purely for financial reasons. We cannot understand who will respond for you in the future. We have a community there—the Royal Aircraft Establishment which became the Royal Aerospace Establishment. We were expected to do research in aerospace in the new technology. Now with the DRA, so far as we are concerned it is being destroyed.

(*Mr Webb*) Let me add something to that. The questions and answers go to the heart of the problem in the whole of the defence industry and I include the DRA in that. *Options for Change* was announced in June 1990 and since then something over 100,000 jobs have been lost in the defence related industries. There are even greater hidden numbers than that because of the sub-contract situation with the defence suppliers. The DRA sees itself now in the middle of this dilemma; whereas the only option for change that the staff see is the option of redundancy or having a job in a process of very rapid change, none of which has been planned and none of which has been adequately explained to them. That covers both the suppliers and the public sector of the defence industry. Where you get a lack of morale it is basically because there is a lack of any element of planning in this whole process. Once you throw the whole thing open to market forces, and given the nature of the defence industry which has never been subject to market forces in its entire history to any great degree whatsoever, you get this very rapid change without any real understanding by the staff of exactly what is going on and what their career prospects are. So the DRA is part of the wider problem. I know that we are focusing on the DRA but I can assure the committee that in dealing with the defence suppliers the management of the major defence suppliers are as confused as are the employees at the DRA.

(*Mr McDowell*) Could I make a point in answer to the point you made about the difference had the DRA not been in charge? Basically, the main difference would have been that had the MoD been managing the change that we have been talking about in relation to the changing defence budget, we

[Lord Craig of Radley *contd.*]

would have seen a more gradual approach to achieve the objectives of managing the budgetary changes and responding to changes in those budgets. There would have been great care taken to preserve the science base. The problem that the DRA management had *per se* was quite different in that it had to manage another change, which is the change of culture. Therefore the mixture in terms of a change of culture and at the same time responding to a declining defence budget brought about greater pressures which inevitably meant that there was more danger of losing the total capability of the organisation, or some of the capability of the organisation, which I think the MoD would have gone to great pains, and would have been in a better position perhaps, to preserve.

253. The previous speaker, Mr Webb, touched on market testing. Were you referring particularly to the current grounds of market testing that are mentioned?

(*Mr McDowell*) Yes, I was indeed.

Lord Howie of Troon

254. We seem to have got on to engineering services rather earlier than we had hoped to do, though there is nothing wrong with that. As I see it, the issue appears to be whether cutting the central engineering services department and reducing the scope for free access to such services makes for more efficient use of resources at the DRA, or whether it weakens the overall performance of the DRA. Secondly, somewhere in the evidence—I forget where—you suggest that a lower standard of work is being offered by external sources. Do you have yet any direct evidence that the standard is lower from outside than it is from inside?

(*Mr Clarke*) Yes, we have. We on the industrial side are constantly being asked to put right some of the components or products that come in that have been contracted out. We would never deny that there are many outside people within the private sector that have skills similar to those that are required by the Defence Research Agency. But the people within private industry have not got the experience. I think that the years of experience in a research environment count for an awful lot. It is certainly different when you have to work with scientists rather than work off a drawing or a piece of paper. We have many projects that have developed, and develop day by day, with the engineering services working directly alongside the scientists. We believe that that is the best method of achieving the DRA's objectives.

(*Mr Jordan*) It is not a criticism of outside contractors. There are some excellent engineering firms throughout the country. What we are criticising is the fact that we work hand in hand with the scientists. They may come down with a drawing, sketch or idea and work with a technician or an electrician or whatever, and we believe that that facility will disappear. The scientists will not get the same response with an outside firm which is profit motivated. Our only motivation is to provide the best service that we can. It is not only good for the DRA but ultimately for the British Government and defence, which is what we are there for. We do not believe that taking that work away from in-house will get the best value for money. There are some things more valuable than making a profit or getting things cheaper. The service that we provide we feel is far more valuable than any monetary gains.

Lord Craig of Radley

255. As I understand it, you are suggesting that there is a synergy in the in-house arrangement between the scientist and your supporting side which is very valuable. Is that right?

(*Mr Jordan*) We believe that strongly, yes.

Lord Dainton

256. I speak as one who went to the RAE in June 1939. But more importantly, what you are saying is that when you are dealing with innovative work, it is important for the scientist and the technician to be close together. Is that it?

(*Mr Jordan*) Yes, absolutely.

257. I understand that. But is there not a possibility under the new arrangements, now that the engineering services is a cost centre, for it still to have to wash its face financially by doing some outside work? After all, is that not what was intended in the change—to make the DRA earn its own income?

(*Dr Peeling*) The main suggestion by DRA is to make the link between the engineering services and the scientist even closer by putting the engineering services into the business sectors. I think the feeling is that their prime business should be the service of the DRA scientists. But the problem is one of commercial immaturity within the DRA. We have business sector directors doing budgets for the first time, taking on a fixed overhead which they are not absolutely sure that they will be able to cover during the next year. They are being very conservative (with a small 'c'). They are being very careful.They do not want to take on this work and they are saying to themselves—inaccurately in our opinion—that if it proves that they need more engineering services, they can buy it in from outside. But to answer the point about the synergy between the experienced people used to working in a research environment and the more production oriented person that you buy in from outside, that is no substitute. I think that we have a resource that most companies would kill for and we are likely to dissipate it.

258. That is precisely why I am suggesting that you keep the staff and use them as it were as a saleable group of people, not to lead you but to be on contract research with other lively development companies outside which lack those resources and cannot afford them because they are too small.

(*Dr Peeling*) The problem is that the services for business sector directors is business that they have not won. It is a fixed overhead that they are taking on. They see the effect on their costs.

259. Is that within the DRA?

(*Dr Peeling*) Within the business sectors of the DRA. There are very strong financial pressures quite rightly from the centre of DRA to make a profit. This is leading to a very conservative fiscal approach within the business sectors. Therefore they are taking on the absolute minimum of engineering support that

[Lord Dainton *contd.*]

they think they can be absolutely sure that they themselves can use. They are not even taking on enough for their own uses, let alone the fact that they could maintain a higher level and take up the slack by outside contracts.

260. Let me ask another question. This of particular interest because the universities in this country are under very considerable financial pressure at this time for financial cuts. They are quite often gaining income of this sort particularly from their engineering departments if they are located in areas which are big industrial areas and where there is scope for selling some of their services. Is that a model that could be followed?

(*Dr Peeling*) It is possible, but the business sector directors are not taking that risk. Therefore the possibility is going to be lost because those staff will be made redundant rather than transfer.

(*Mr McDowell*) I think it is important to make the point that probably if they were given the opportunity to trade in the fashion that the noble Lord suggested, there would be problems with the potential competitors for that work saying that this was unfair competition.

261. But you cannot put the DRA into the marketplace and ask them to compete and then say, "No, you must not; this is unfair competition", can you?

(*Mr McDowell*) I would agree with that entirely.

(*Mr Clarke*) Perhaps I could answer Lord Dainton. Engineering services as a sector was never allowed within the DRA's framework document to compete with private industry for engineering work. We could only supply a service to a business sector that had won a project that included some element of engineering. We have never been allowed to go out and compete for engineering work.

262. So are you fundamentally restricted to be, as it were, the service industry within the DRA to the departments which already exist for the market sectors?

(*Mr Clarke*) Yes.

Chairman

263. Would you welcome the opportunity to become a profit centre in your own right?

(*Mr Clarke*) We could. We believe that we have gone through a process of rationalisation over the last year which has made us competitive. We accept that we must be competitive, because the country demands value for money from everybody in public service these days. I think that is only right. But we would not like to lose our link with business sectors and scientific departments. That is the role that we are best suited to: research engineering. That is what we should like to keep in-house. We have never gone out to compete within private industry, although in the past we have been known to provide a service, as Lord Dainton pointed out, to private industry in doing some of their engineering research. That service is no longer available.

(*Mr Webb*) The question has to be asked: what is the market? The market is shrinking. The whole defence market is changing and shrinking at the same time. Not only is there less money available in the market, but also the products are entirely different. The market in engineering—what we still have left of it in this country—is going to be increasingly civil related rather than defence related. Unless there is a crossover from defence research into civil research and civil applications, then the key elements of all the work that has been done at the DRA, or a large amount of it, will be lost, because the big defence suppliers have their own in-house engineering services to whom they will give preference rather than outside contractors, for obvious reasons. I personally would be very pessimistic as to whether there is anything like the market that there is presumed to be if the DRA is required to sell its services outside in the purely defence field.

Lord Howie of Troon

264. I should like to go back to the question of sub-standard work. We were told a short while ago that a certain amount of work required to be rectified when it came in. Can you tell me whether that is a significant proportion of the external work or is it merely marketing?

(*Mr Jordan*) We can only quote on the work that each individual trade group receives. It is not a question of sub-standard work but a question of work that requires re-working. The work is done outside. The scientist or whoever decides on a new project that he wants to build. It is constantly changing as he gets new ideas and we prove things wrong or we prove things right. We are saying that if it is made outside with a sub-contract firm, it may be made perfectly well; but since then the scientist will have developed the project further. So it comes in. But you cannot keep going back to a contractor and saying, "Change this. Make it of thicker material or put an extra bolt in or change a weld" because the cost is prohibitive. So they get as far as the scientist's last instructions. It comes in to us and the scientist says, "I have changed my mind. We don't want that; we want this" and it is up to us to re-work it. I am sure that that cannot be cost effective.

Lord Renwick

265. I should like to follow up Mr Webb's point and note his obvious concern that perhaps there is not much transfer from defence research into civil use. But we seem to have had evidence from both the MoD and the DTI that there is a new spirit of co-operation between them. However, it also seems to me that we have had evidence that has been calling for the DRA to forge stronger links with the DTI and industry in developing dual use. Perhaps you could give us some measure of how you believe that the new schemes like Pathfinder and strategic alignments, or the new technology centres perhaps or even possible reforms of LINK, could affect the situation.

(*Mr Webb*) I will field that question first of all. Those initiatives and programmes that you have mentioned are extremely welcome. But I have to say that I think the DTI is more responsible, if one has to give the burden of responsibility, for doing nothing over the past five years than is the MoD. Because we have made repeated requests to the current Secretary of State for Industry who was an interventionist when he was on the back benches to ask the DTI to

[Lord Renwick *contd.*]

become more involved with the problems of the defence industry. We understand from within - unfortunately they are reluctant to meet us to talk about it—that there have been some internal changes and some stronger contacts with the MoD. But here you have two very different cultures. There is the DTI which has still mainly a hands-off, let-industry-get-on-with-it attitude, and the MoD whose main business is to harness its resources and follow its political leadership, such as there is. The MoD has found itself in a downward spiral without the necessary knowledge—because they are very much militarily related civil servants and Ministers in there—of what the outside industry requires, particularly in the transfer from the defence to the civil sector, which is the key to it all. When the Secretary of State has replied to questions about what he is prepared to do about the run down in the defence sector, he has said (we have written evidence of this in many cases) that it is for the companies themselves to decide what their opportunities are. But again, in the culture of the defence companies, most of the senior management are either ex-MoD people or come directly from the military. They have been extremely useful in obtaining sales and selling exports but they do not have anywhere near the expertise in looking at the commercial field. They do not have the right management, they do not have the right expertise and they really do not know what the markets are. In the civil sector these days we are talking about niches rather than grand tranches of exports. There is a major cultural difference. I think the efforts that they are now making are only fiddling at the edges of the problem rather than dealing with the whole question of diversification.

266. It is a very big subject to encompass within one question. You say, quite rightly, that the staff of DRA do not have the commercial expertise. I can say, having visited there, that I think many of the applications of research going on would be of great interest in the civil field. Are you happy that you have the mechanisms to attract attention from the civil contractors and civil companies?

(*Dr Peeling*) I go back to the original comments about the difficulty of diversification in the engineering services being not the same as in research and technology. I think that there is more possibility in research and technology. I would agree with the rather negative comments that have been made about the DTI's past performance. But there is an indication, though we have not been told of it directly, in the last DRA Report and Plan that there seems to be a new spirit of cooperation between the MoD and the DTI which, if it were developed, I am sure the IPMS feels would be of great value. I believe that there are some advantages in the DRA's status in that previously the relationship between industry and government research establishments has been very much one of industry wanting intellectual property for nothing but not really appreciating it because the government research establishments did not understand what was necessary to be done to exploit something. So I think that there is an advantage in that there is now a much more clear headed view in the DRA about what work must be done in their transition to technology. That is the good point. The bad point from industry's point of view is that the DRA now understand the value of its intellectual property and that the contractual negotiations which will surround the DRA's new technology centres will be a minefield. They will be truly awful because outside industry is not used to paying for access to that intellectual property. So there is a balance that has yet to be established. But there are a lot of good possibilities.

(*Dr Ellis*) One of the underlying problems is the question of who will fund it. The DTI, as we know, has vastly reduced its funding and says that it wants to opt out completely from supporting directly research and development and from funding development projects, which would surely be the sort of funding which would be required to get some of this cooperation off the ground. The DRA itself is strapped for cash even from the MoD end. So the funding aspect comes in very strongly here. As Tim was saying, with the number of industrial customers that are around the market is quite small. Therefore some pump-priming will have to be done through government funding, whether that is through the MoD or the DTI. But both of those departments seem to be moving in quite the opposite direction.

Baroness Hilton of Eggardon

267. My question has more to do with the relationship with the MoD. You were talking earlier about close relationships with the military and defence and the DRA. You are also, I think, pursuing better pay and conditions for DRA staff. Currently your close relationship is partly due to an interchange of staff, is it not? If you are operating under different conditions of pay and so on, in future presumably that will become much more difficult and staff of the DRA would be reluctant to be posted to the MoD and so on. Is that right?

(*Dr Ellis*) One of the problems is that in fact at the moment the agencies are doing far worse in pay terms in general than the Civil Service. The Civil Service is doing badly enough, but the DRA and many other agencies are so strapped for cash that they are not able to improve the conditions of service. As my colleagues will tell you and give examples, they are positively going down in terms of the amount of pay that is available, other allowances and so forth. So at the moment that is a hypothetical question. But certainly our general view as the IPMS would be that it is so crucial to our members in the nature of their work and to the MoD and the Government's science policy as a whole that there is interchange and feeding of scientific expertise into the main departments as both intelligent customer and as policy maker, that we would be prepared to forgo some of those hypothetical benefits in order to maintain that interchange. We also think that the current Civil Service pay system is now much more flexible and quite a lot of market forces and flexibility can be encompassed within it. They do not need, at least at this point in time, to break away into a totally different system.

268. So it is not necessarily a problem even if you do not achieve better conditions for staff. Notionally, the idea about agency status is that you can start

[Baroness Hilton of Eggardon *contd.*]

paying people better salaries. That is the carrot that is often held out, is it not?

(*Dr Ellis*) It may be held out. But in all these cases change is having to take place in a context of cutting expenditure , and we all know that is the very worst context in which to make changes.

Lord Dainton

269. But to my mind there appears to be one area, according to the statement in paragraph 1.1.3, namely administrators, where there is now duplication which did not exist before. You say that "administrative skills, hitherto provided in the main by the MoD centrally, have now had to be duplicated by the DRA". I do not understand that at all. I do not see why that should be necessary.

(*Mr McDowell*) The main problem is associated with the change in the status of the DRA to an agency. In making that decision the personnel management function which had hitherto been centralised within the Ministry of Defence then had to be taken on by the DRA. The DRA, as it has done with pay, could have retained an element of support from the MoD in relation to personnel management, but it chose not to do so. Also within the Ministry of Defence itself there is further delegation as a result of government policy. What is happening is that the resource of personnel management is becoming extremely scarce. Professional personnel managers are extremely valuable. The expertise which was available to the MoD and the DRA has been dispersed to meet that new demand. I think that there is now a difficulty in relation to having picked up this particular problem. It will clearly mean that the DRA has to find more expert personnel managers in order to manage the human resources. We are finding that that is true of other aspects of the management of the organisation. Whereas the MoD did it before for them, the DRA now have to do it themselves.

Baroness Hilton of Eggardon

270. Let me pursue that point a little. We heard last week that there has been a reduction in the number of people going on training courses. Is that due to the same thing to some extent?

(*Mr McDowell*) The answer to that is to be found in the workloads of the individuals in the DRA. To get time off to attend a training course becomes a luxury. In terms of their workload and so on it cannot any longer cope.

271. But it would now have to be paid for out of a separate DRA budget, would it not?

(*Mr McDowell*) Yes, it would.

272. Might that be the reason for sending fewer people?

(*Dr Peeling*) I do not believe that that is the case. That money is available in all retraining budgets and people do not spend it. It is routine for people to work 60-plus hours a week. If you take three weeks off for a training course when you have 15 deadlines to meet for an absolute priority, you sit there on the training course worrying about your in-tray growing.

Lord Craig of Radley

273. May I move on to the subject of the DRA's research strategy? There is a point I noted in both the IPMS submission and the MSF submission—for which we thank you very much. In the IPMS submission you say at paragraph 1.2.1 that "there is evidence of a worrying trend towards shorter term research". The MSF very much echoes that by saying that "Our main cost fears are that market pressures may cause the managers of the DRA to downgrade longer term research in order to produce 'results now'". I should be interested to know if you have some evidence which you could help us with to substantiate those quite stark statements. It might be as well, to ensure that we are all on the same network, if you also indicate what you mean by "shorter term research" and "longer term research". I imagine that longer term is blue skies, as it were, but maybe you have a different way of expressing it. Would you like to comment?

(*Dr Ellis*) I will hand over to colleagues in a minute because they know about this in much more detail. One of the main areas of increase in short-term pressures has been the need to be more market oriented. Quite a lot of scientists who would otherwise be used on longer term research are diverted into preparing project specifications.

274. Do you have a percentage figure or an example of how you substantiate that quite important statement?

(*Dr Peeling*) You probably know that the budget for research is split between what is called the strategic research programme and the applied research programme. That split has not changed significantly. But within both programmes all one knows is that the projects that one sees put forward have much more focused objectives to be much more attractive to the customer. The focus is usually given to short-term results, possibly at the expense of long-term results. I do not believe that it is a question of us giving proof. I think that what the IPMS is saying is that the MoD should consciously decide what split they want between short-term and long-term research and not allow it to happen unconsciously. What is happening at the moment is that the mechanisms put in place naturally encourage proposals that have a short-term flavour.

275. I am sorry to pick you up on that point. You quite rightly say that the MoD, for example, splits between them DCSA's element of the DRA tasking and DCDS (Systems)' on the other side. Also the DTI tell us that they put funding into what one might call the longer end or the blue skies element of research. It seems to me that in funding terms that is the practice.

(*Dr Peeling*) That is right.

276. Are you suggesting that it is in spite of that?

(*Dr Peeling*) Within those budgets you are drifting toward more focused objectives because DRA is selling itself. It is much more easy to sell something that affects the MoD's bottom line (to use a commercial term) in the next six to nine months than it is to sell something that will affect their bottom line in six to nine years. So naturally there is a drift toward delivering short-term value because it is so

[Lord Craig of Radley *contd.*]

greatly appreciated. That is not necessarily a bad thing. What would be a bad thing is if, like a primitive people, you were to eat your seedcorn. We are suggesting that the MoD should monitor the situation to make sure that they are comfortable with the allocation between the more speculative research, even if it is speculative between one and two years, of the one and two years compared with five to ten years. But there is definitely a drift and the MoD may well be aware of this and may be quite happy with it. It is entirely right and proper that they should make their own allocation. But there is a worry certainly among our members in the sites that this is happening as a result of the changes without a strategic realisation within our customer.

277. There is a follow up to that. One of the propositions that has been mooted is that the DRA should make some sort of levy, like what is called a Rothschild levy, on their charges in order to give the DRA some flexibility to do blue skies research, which they believe would be the most sensible way of going in the longer term.

(*Dr Peeling*) The only problem is if that makes for a perception within the MoD that buying effort from the DRA is more expensive than buying from our competitors. If this levy meant that we lost a lot of business within the DRA, I would say that it is a bad thing. Again, it has to be the MoD deciding on the mechanism, if they want to have a mechanism in place, and it is for the customer to decide that mechanism, it is merely for the unions within the customer organisation to raise the issue, so that it does not happen by accident. I do not know whether that mechanism would work. I do not think anybody does, and that is the worry.

Lord Dainton

278. In paragraph 1.2.4 of the IPMS submission you state that "The customer/contractor relationship is also driving a perceived need to meet the quality standard BS 5750, which is resulting in considerable inefficiency and will be no guarantee of any further improvement in research quality". I leave the rest of the paragraph and the next one. Would you like to flesh out to us what seems, on the face of it, to be a very paradoxical sentence; namely, that those systems which have been invented for improving the quality are working against it in your milieu?

(*Dr Peeling*) If you will excuse me I shall just give a short two or three minute lecture on BS 5750 as it applies to an organisation like the DRA. The first point to make is that there is nothing theoretically within BS 5750 which is not entirely appropriate to an organisation like DRA. That is the first thing. The second statement is that it is much easier to see how it applies to a production organisation. The third statement is that most existing processes that are published as exemplars come from production line organisations. Therefore there is a tendency for organisations such as the DRA to bring in management consultants and to start from a set of guidelines that originated in a production environment. That first problem is the application of a production oriented process within an R&D organisation. The second is the size of organisation in which you apply it—the buzz word is the "granularity" with which you apply it. There has been a lot of comment in the press from small companies which have been asked by the MoD for BS 5750 certification. We hear humorous stories such as the window cleaner being asked to be BS 5750 certified—as a seal of approval. The application of BS 5750 benefits an organisation when the complexities of the organisation cause inefficiency. It is not a seal of quality. It is a seal of reproducibility. People tend to say, "Oh dear, I am terribly sorry, Mr Customer, that dropped down the cracks." You can regard BS 5750 as the grouting for the cracks. But that does not necessarily ensure a good floor. It ensures that if you are doing a bad job, you are doing exactly the same bad job as you have always done. Within an organisation that is getting into double figures in terms of the units that are working, and definitely when it is getting into three or even four figures, in that organisation, if you are applying the standard, then the efficiency of documenting your processes can save a significant amount of money and improve reproducibility. One of the problems in the DRA is that our contracts are set at too small a level. We have many one and two person contracts. In my opinion there are far too many one and two person contracts. If you apply the overheads of a process that benefits the ten and the 100 grouping, you tend to get an amount of overhead which is significant against an amount of saving which is moderate. The fact is that the production oriented system does not fit naturally with the research system. Let me give an example: software development. When you are developing software in a production environment you do it top down. You define a requirement, implement a specification, do a top level design, code the components, and test and integrate the components. The software that much of DRA is developing is to explore a possibility. That tends to be done from the bottom up. You create a series of useful modules and put them together in useful ways. If you put them in in a different way, it does better. You build up an edifice from the bottom up which, if it were to be brought into production by another company would then be re-engineered in the top down way. Unfortunately, the software processes within BS 5750 are fundamentally production oriented and fundamentally top down. Therefore we are trying to fit the proverbial round peg into the proverbial square hole and it does not fit very well.

(*Dr Ellis*) Given that BS 5750 is not the appropriate mechanism, we still think that it is important to measure performance but to measure it with appropriate criteria. With the change in focus in the DRA there are likely to be less opportunities for using conventional publication indices. That sort of performance indicator may well decline for scientists in the DRA. We have to find other ways to signify that their performance is good, in addition of course to the fact that DRA is a satisfied customer, which is the basic performance indicator. We recognise the need for signifying performance in relevant ways, especially given that the old ways for signifying performance in basic research will not be so available.

Lord Redesdale

279. In your submission you gave the impression that the new emphasis on competition between elements of the DRA was quite negative in its effect. Is there a case for a positive argument for competition within the DRA, or do you think it is causing massive problems?

(*Mr McDowell*) In order to have an answer to your question you need to see that there is good and bad. Potentially, the good is that you will, at the time when you are considering the cost to the customer, be able internally to establish what that cost is through competition between the parts of it. Then again, at the end of the day what this will do is drive down the profitability of the DRA itself. Furthermore, if you take it to its extreme, you will get areas of the DRA competing for very scarce highly qualified scientific staff in the marketplace to recruit them. That means that they are bidding against each other for that valuable resource. So in that case you voluntarily increase your own cost in the marketplace for this. We feel that perhaps there are ways to minimise the bad effects of this. That could possibly be by looking at the managerial structure of the organisation. At this present point in time, with the business sectors as they are arranged, we feel that if there were a divisional structure similar to the one that existed previously, perhaps that could help to soften the consequences of some of the bad effects of this particular problem.

Lord Dainton

280. One is very conscious of the fact that new devices of various kinds come from the imaginative consideration of what is and the problems that are presented. What room is there in an organisation which is so tightly controlled in cost terms for that speculative work? Has there been a squeeze on it?

(*Dr Peeling*) I think in fact you have here a problem which organisations have a difficulty admitting to, which is that most inventions are the result of serendipity. One does not like to admit that whereas one was designing Apollo 14 to go to the moon, in fact what one got out of it was the non-stick frying pan.

Chairman

281. That is not correct. It is one of the myths of the twentieth century.

(*Dr Peeling*) Yes, excuse me for that. What happens is that when you are researching in one direction something occurs which is more exciting than that in the direction in which you were going. That will stand or fall by the relationships of DRA researchers and the contracts we have with our MoD customers. If the series of deliverables and the contract we have is paramount, you will be able to change direction. If you have a good relationship with your customer you should be able to hot foot it to the customer, present this opportunity and ask him to replan and resubmit your proposals. At the moment I think we are a bit rigid. That is partly because not all aspects of the MoD's role of intelligent customer are working properly. It is a new role for the MoD. I think there is a justifiable tendency at the moment to micro-manage at too great a level of detail. As confidence is established between the customer and the contractor, one can start acknowledging the luck that underlies most great scientific developments and hopefully the customer will welcome modifications to the programme from which the customer will derive greater benefit. But it is a worry.

Lord Dainton

282. Can we put it another way round to be comprehensible to an old person like me? Are you saying that this management of change is having to be tightly controlled but you hope that when the system has in fact made its major change then it will loosen up in its normal way to allow that sort of thing to happen?

(*Dr Peeling*) I do not think "loosen up" is right. I think it will have the same level of detail but an acknowledgment of change within that, so that you are not punished by going to a customer and saying, "I wish to change direction because I believe that it is beneficial to you." At the moment there is a reluctance to tell the customer that there is a good change that can happen.

Lord Craig of Radley

283. I should like to take up another point in the IPMS submission where you say, in paragraph 1.6.2: "Government should learn important lessons from the privatisation of AWE, which put a key area of scientific capability outside direct public control". We have all acknowledged that AWE was both a production as well as an R&D establishment. I might take issue, but I do not want to explore it now, with the use of the word "privatisation", bearing in mind that the ownership of AWE is still with the MoD; it is only the management that has been contracted out. Nevertheless, putting those points aside, do you feel that there are lessons to be learned? I should like you to explore that if you will and to hear what you have in mind.

(*Mr McDowell*) To answer that question we must set it against an international background. After all, we are talking about an issue which affects not only the United Kingdom's defence effort but also that of our allies. Obviously our members at AWE are concerned in terms of research. They are rather pessimistic about the future of research being done at AWE now that it is no longer a part of the MoD. They feel that it will inevitably drift toward the DRA rather than stay within the AWE, for the reasons of our international treaties in relation to the exchange of information, with the United States in particular. They are very sensitive about allowing some of their interchange knowledge to fall into the wrong hands. As such, the fear of our members at Aldermaston is that inevitably this will mean a drift back toward the DRA in terms of research. For that reason therefore we want the DRA to maintain a very close link with the MoD, because that at least will be, shall we say, a stop-gap arrangement that will work at the end of the day should that fear come to fruition. With regard to the point we made about nuclear proliferation, there are rules which do apply in relation to business appointments regarding civil servants. If you are an MoD employee, clearly you have to abide by those particular rules. If you wish to take up your trade elsewhere, clearly restrictions are placed upon you

[Lord Craig of Radley *contd.*]

and it could be that your appointment in a certain organisation could be delayed for up to two years in order that you may not, shall we say, use the information that you have gleaned as a result of being an MoD employee in order to bring about a position of unfair competition or whatever. Therefore we feel that now that AWE has been contractorised, and nuclear production, being as it is a production process, those members of staff who hitherto were civil servants will be freer and cannot be constrained by the Civil Service re-employment terms. They will go and take their expertise, as we have seen in post-Cold War Russia, to wherever they can get the best value in the marketplace for their skills. We believe that is a reality and something that we should take into account.

Chairman

284. Could I draw attention to paragraph 2.3.4 of the IPMS evidence? It makes what seems a rather surprising observation that in the DRA "there is an alarming vacuum in management strategy, with virtually no thought yet given to developments beyond 1994"—in other words, beyond the end of this year. I find that surprising, particularly in the light of the evidence you have given us that morale has flattened out or even improved. One does not normally get morale improving when one cannot see beyond the year end. Would you like to comment on that?

(*Dr Ellis*) The first clarification to make is that in that paragraph we were basically referring to the pay strategy and not to the DRA's strategy as a whole. The DRA is in the same position as a lot of other agencies, in that they are being forced very rapidly to devolve themselves from the Civil Service pay system and to delegate pay and set up their own systems. That process is being rushed and they are all being subjected to the same edicts from the Treasury about what they can and cannot do. Although they are supposed to be completely devolved, in reality that is not the case. They are not able to look at this in terms of their own strategy, how they want to develop it and how their personnel policies should develop. They are being forced rapidly into this position by April this year, which is the target date to have a devolved pay system. Certain agencies have said that they cannot do it and basically have said that to the Treasury. So it is not their own strategy that is being developed. They are being forced into very rapid decisions on pay strategy which they might not wish to take.

285. Do you therefore discount the corporate plan produced by the DRA?

(*Dr Peeling*) As I said, I think the comment was about pay and traditional personnel strategy and not about corporate strategy. At the time that this document was written, the general feeling among the members within the DRA was almost wholly negative to the DRA's management of their pay and conditions of service. The use of performance pay was regarded by many staff as extremely old fashioned—the sort of thing that was done a decade ago—and the DRA was going through the same problems that companies encountered a decade ago, with dropping morale due to inappropriate performance pay systems. In literally the last two weeks, a consultation document has come out of a team within the DRA management for new pay and conditions of service, which is radical to say the least. One could not criticise it for not being modern. But I do not think the IPMS has yet formulated a response to that document. The only good thing I would say about it is that it is totally counter to all the DRA's previous pronouncements on pay and approach in the last year or so. So it starts with one advantage.

Lord Howie of Troon

286. I should like to move on to competition with industry. You dealt earlier with the other matter in which I was interested. Both unions identify certain fears of industry with regard to competition with the DRA and both unions refer to the possibility of private firms using research bids as loss leaders in order to get later work. I wonder first whether there is any evidence of that that you can give us. My second slightly more esoteric question is this. It has been suggested in the MSF evidence that fears have been expressed by private industry that the DRA could be taken over by a competitor. Could you give me some evidence about that? That is a new thought to me.

(*Mr Webb*) I will take the second point. I think that fear is very real because there is evidence that part of the Government's philosophy is that as regards the indigenous United Kingdom industries, if they are successful, it is fine for foreign competitors—for whatever reason the foreign competitor may have, either to absorb the human or technical resources or to eliminate competition—actually to take over that part of the industry. We had a prime example, if not exactly parallel to the situation we are talking about today, in the case of the Rover Car Company, which was part of British Aerospace, Britain's largest defence contractor. If the DRA moves out increasingly into the private market, as it is planned so to do, and it becomes an entity in itself, because of its value in its technology and all the people who work for it, it will become a very attractive proposition for possibly a European or even Japanese or American defence related organisation or an organisation that has part of its business in defence to buy it and use the technology and the people to work for it. We are talking now, as the Prime Minister said, about a global market in terms of industrial competition and Britain is now increasingly a smaller part of that global market. The DRA to our way of thinking at least would seem to be a very attractive proposition once it is unleashed from the MoD and government control.

287. It would have to be wholly privatised before that could happen, would it not?

(*Mr Webb*) Indeed, it would.

288. And that is not the situation at the moment.

(*Mr Webb*) No, but other companies that are now entirely in the private sector were once partly privatised and then wholly privatised, as the Government saw it as part of its political philosophy to sell off its majority shareholdings. There is no doubt about that.

289. What about the loss leader?

[Lord Howie of Troon *contd.*]

(*Dr Peeling*) One of the nice things about loss leading is that it is so difficult to prove. There is evidence. It is not in the high tech area but in areas like contract cleaning and council services, where there is quite a wide range of evidence that has been widely published that loss leading has gone on to get rid of the in-house capability. Why should you expect that this is any different, even though it is harder to prove in the high technology area? In fact it is much more profitable because you could probably hire back your dustbinmen but once you have lost a high tech capability there is no way that you will recreate a team that has taken 10 years to develop. The thing to remember is that loss leading is absolutely devastating in the high tech area. Wipe out that team and you have them by the "blanks". We know what is going on. I suspect that if you ask the contract officers in the MoD, they know what is going on. But giving you line and proof is very difficult.

290. I can support loss leading very readily when it occurs in such places as Oddbins, with which I am very familiar. But would it not show up if there were a handful of tenders and one of them was out of line? Would not one which was noticeably cheaper than the rest at least appear to be a loss leader?

(*Dr Peeling*) When you are bidding to take over a DRA capability, every single bid is a loss leader. By definition you are trying (a) to wipe out the DRA capability and (b) to wipe out the competitors' ability to compete with you in the future. Where you can detect it is where the bids, all of them, are ludicrously low. But what do you do? You take one of them.

Lord Dainton

291. But as I understand it, you have a prime duty before anything else to advise the Ministry of Defence. Is that not right?

(*Dr Peeling*) But we are being opened up to secondary competition, which means that a certain proportion of the work that the MoD has previously put directly with us has to be offered to outside companies as well.

292. Even in the advice area?

(*Dr Peeling*) No. But the advice is based on our research. The main reason that the MoD pays for R&D is because they know that consultants who do not actually practice are of no use. So potentially we are losing the bedrock from which that expertise comes for offering that advice. I cannot remember the proportions but the percentage of money that comes from consultancy to MoD is very small—about 10 per cent. against 90 per cent. It is very small. But one of the main reasons for sustaining that 90 per cent. is to get it right. One day's advice can win a war.

293. That is precisely why your position seems to me to be very much more secure than you have suggested.

(*Dr Peeling*) It is up to the MoD to detect loss leading in secondary competition.

Lord Howie of Troon

294. Presumably some sort of estimate is made of the anticipated cost of a contract and the estimate would be set against the bids which come back. They might raise suspicions of unduly low bids which would have further consequences in later costs at a later date. Are the MoD obliged to take the lowest tenders? Is that a rule?

(*Mr McDowell*) This is really hitting upon the Government's market testing philosophy. That is in itself a subject which would take me several hours to give a full airing. Nevertheless, the main problem associated with the market testing programme is that you are duty bound to put functions out to competition. Very often we, as unions, have to struggle to get proper arrangements for consultation about how those exercises will be conducted. Then, having got the proper consultation procedures in place, we find that sometimes they are not implemented properly. We sometimes try to insist that there will be in-house bids, for instance, but in many cases in-house bids are not drawn up. We like to insist as unions that there will always be in-house bids and that they will be expertly brought together, if necessary by assistance from people who are competent to do that, so that they will be matching the drawing up of the bids that come from outside sources in their expertise and bringing them together. It is a matter of fact that so far the main criterion for judging whether or not an in-house function goes out-house is done mainly on the basis of cost. If the in-house costs are higher, and even where we have evidence that sometimes they are about the same, then they have gone outside. Therefore we have for some time been striving to get a level playing field, as it is called, on these issues. Now we are very fearful of the consequences of it in relation to the MoD as well as the DRA because, as my colleague has already said, once that function goes outside, you can no longer bring it back in. And the next time round you have created a privatised monopoly because that particular function is unique to the United Kingdom's defence effort. We are very fearful if this occurs in several areas about the way that more and more of the defence budget will become open to the whim of the marketplace, unless the MoD then brings about special policies to cope with that situation.

295. Are you telling me that the MoD's policy is to take the lowest bid?

(*Dr Peeling*) The lowest compliant bid.

296. As against the notion of what you might call long life cost?

(*Dr Peeling*) Yes.

297. The long life cost is a secondary consideration?

(*Dr Peeling*) Yes, but there is an issue here on organisational learning. Loss leading is something that most people letting out contracts only do once. The trouble is that people change. Particularly within the MoD, desk officers change with frightening rapidity. They do only a three or four year term. So the new man or woman comes in and makes the same mistake and we lose another piece of capability. They never make that mistake again, but then another person comes in. The other problem is the rate of change with market testing. So much is going to happen so quickly that you will only realise the cost of it when so much has already been lost. There is the

[Lord Howie of Troon *contd.*]

rate of change aspect and also the organisation learns from being burned by loss leading bids. Organisations are notoriously bad at learning that lesson.

Baroness Hilton of Eggardon

298. Perhaps I may pursue the letting of contracts. It may be my lack of knowledge about the MoD but I do not understand how they have the scientific and technical knowledge to decide between bids without consulting the DRA. The DRA seems to be the place where the science and technology knowledge is rather than the MoD. Is that right?

(*Dr Peeling*) There is a group within the MoD called DSciences (the Director of Science) which has its own in-house expertise on science which they use for judging. Most of those are ex-DRA people. So they have a source of in-house expertise. But usually the DRA people who are bidding know why the other bids should not be accepted but if they are in competition they cannot see the bids to tell the MoD where they are being conned.

299. There seems to be a wilful disregard of available technical knowledge.

(*Dr Peeling*) How close is the relationship?

(*Dr Ellis*) This is the nub of the issue. It is very difficult to find a clear-cut answer, because if there is a very close relationship between the MoD and the DRA—which we argue there should be because the function that the DRA performs and the highly crucial function it performs with the importance of high quality and long-seeing strategy in the defence area—this will involve accusations of unfair competition. On the other hand, the Civil Service through its market testing initiative and various other Treasury rules is being subjected often to much harsher rules, particularly internally about what and how accounting is done and who is separate from whom and so forth, than a normally private company would be. They can do loss leaders whereas it would be very difficult for a government agency to do loss leaders because of the very tight accountancy rules about what they regard as fair competition and relationships being accountable between various parts of the organisation.

(*Dr Peeling*) There is also the issue of marginal cost bids against total cost bids. The Treasury rules that when we quote a service, for example for the use of a facility, the bid must be based on the full economic costs and not on the marginal costs. It is not fair.

Chairman

300. Does this amount to a fairly strong case for challenging the whole basis for the DRA being a separate organisation? In other words, should not the MoD and the DRA be a seamless robe, so that they are interdependent?

(*Mr McDowell*) I hear echoes of the past in that remark. When we faced a steering committee within the Ministry of Defence which was looking at the possibility of setting up the Defence Research Agency, one of the things that we said at the time was that we believed that if they were going to go ahead with the setting up of a defence research agency, it ought to be a defence support agency, as they were called in those days—they are referred to as defence agencies now—that is, an agency within the Ministry of Defence itself. That would bring about the ability to be able to share some of the support facilities already provided by the MoD, as I answered in relation to a question from Lord Dainton. We felt that if we had a defence support agency type of organisation within the Ministry of Defence, that would be a much better organisation. But it is all too late for that now.

(*Dr Ellis*) On the other hand, as a trading fund in its current situation, although there are certain problems that also need to be sorted out and we are talking about them today, we think that the major disaster would be full privatisation because the MoD and the country would lose its basic security. There are the problems of international agreements, discussions with other governments and the whole issue of intellectual property rights—all those things would come fully into play, as would the question of take-overs. That is the sort of scenario, given what the Ministry of Defence and the DRA are supposed to be doing in terms of national security, which we think should not be contemplated. It is trying to get a balance between what people see as fair competition. We recognise that we are now in a competitive situation and there is no going back on that. We recognise that there are certain links between MoD and DRA that have to be maintained to keep quality. We also recognise that the ideologically clear picture that this Government seem to have about how the market works and what private organisations are like is far too pure a model. We should not be asked to meet that model because nobody else meets it. We think there is a half-way house, which is really where the DRA is now, but with these various problems dealt with. We feel that the problems could, with imagination and more flexibility from the Treasury, be dealt with while not damaging the national security and Britain's defence.

Lord Howie of Troon

301. Let me ask a very elementary question—and perhaps I should frankly blush—which is this. Can you tell me whether there are many good competitors to the DRA, or is it a small number?

(*Dr Peeling*) The main competitors are companies such as Smith's Engineering, Coopers & Lybrand—companies such as those, which specialise in defence consultancy. The secondary competitors are the primes—people like British Aerospace, Dowty and CAP-Sema, which also, as a sideline to support their prime business, do high level studies and advise. So the real competitors are the Smith's Engineerings of this world who correctly see the DRA as formidable competitors now. I do not believe that you will ever see the DRA prime on a defence project. In fact I believe that the Framework agreements will not allow it.

302. How many Smith's industries are there—one dozen or two dozen perhaps?

(*Dr Peeling*) There are half a dozen in the country.

(*Mr McDowell*) In the United Kingdom.

(*Dr Peeling*) And 100 or so worldwide.

(*Mr Webb*) Most of Smith's is based in the United States.

Chairman

303. Can we be quite clear about what you perceive as the threat of privatisation? I understand the point that has been made about privatisation by the back door, by loss leading and moving a facility by the back door into the private sector. But when you talk about the threat of privatisation, as you have done on a number of occasions this morning, are you referring to take-overs by some of the organisations that you have just mentioned or moving some of the research establishments into the private sector?

(*Dr Peeling*) A number of government Ministers have gone on record as saying that agencies are a good first step to privatisation. There are numerous cases on record. Is it surprising that our members listen to them? The other worry is the "one step good, two steps better" argument. You can see the step that has been made in many ways as being very good. I think the Chairman has indicated that perhaps a slightly smaller step might actually have been better. But the worry is that people will project from where we have gone and assume that another step will be even better. But the main benefit has been to customer satisfaction because the MoD has the ability to stop payments. That is the big gain that has happened from the point of view of the public purse. The ability to stop funding has taken us in the DRA off the Vote and has concentrated minds wonderfully. The next step to privatisation means no extra benefits and throws away all the advantages that we have with the close relationship. So the worries we have, which have been addressed by a number of Peers, are just about livable with at the moment. They are causing winces here and there, but generally speaking it is okay. Go toward privatisation and those smoulderings will burst into flames.

304. Can I move on to something which the MSF evidence deals with at some length and that is a most interesting proposal for a defence diversification agency? Would you like to say anything further about that, Mr Webb?

(*Mr Webb*) Thank you very much. It is a very big subject in itself. We have addressed it together with our colleagues in the IPMS and the Transport and General Workers' Union in the appendix to our evidence. We believe that the whole question of defence diversification is crucial to the shift from the over-emphasis in defence in this country to the problems that we face in the civil sector. Let me say first of all that our research and development in defence has been a success story by and large in this country because we competed more than adequately on the world market with very sharp competition. It has been a success because so much of the financial resources that government have available have been devoted to it. Over 50 per cent of government R&D (it is a well known figure) has been devoted to the defence sector. In particular areas like defence electronics we have been extremely successful; and again in the area of avionics, which is part of that overall sector. However, the problem has been that the technology that has been developed has been locked up for national security reasons and for cultural reasons. I hesitate to use the word "cultural" but I cannot think of a better term. It is just a way of doing things and a way of thinking perhaps. Too much of that successful technology has been locked up. For instance, at the Royal Radar Establishment at Malvern we were well ahead of the international pack in terms of working on semiconductors and microchips, but it was locked up and did not leak out into the civil sector. We know what has happened with the Japanese, who spend far less of their national resources on defence R&D than we do as a proportion of GDP. They have swept the market in the field of electronics. It is no exaggeration to say that we believe that if Britain had not locked up so much of its electronic technology in defence, we could have been possibly in there fighting with the Japanese in the area of consumer electronics, developing such products as the video recorder, the Walkman and the rest. They are not exactly of total benefit to humankind but nonetheless they sell and generate a lot of revenue, and we are part of that market. So the problem is easy to describe, and it has been known for some years. But the problem then arises: how do you make the leap from defence into civil technology, even if the will is there? There have been some pretty brave attempts to do that in practice. One goes back to the Lucas aerospace programme of some 10, 12 or 15 years ago. The scientists and engineers at Lucas tried to specify products that could be produced as mainly socially useful products rather than working on the perceived defence needs of the company. That did not succeed because neither the government of the day nor the company particularly wanted to pick it up. What we now see is that with almost the abolition of the Cold War and the decline in real terms in defence spending, the defence companies themselves (and every senior manager in a defence company if you talk to him privately will tell you this) face very severe problems from which they can see no way out. But then the problem becomes one of "You tell us what you think we should make and then perhaps we will look at it". That is where the real problem lies. We tried to look at it from a different angle. Rather than predicting, say, a solar powered fire-engine or something like that—one needs only one ridiculous example and the whole argument goes down—we say that teams of scientists and engineers from both the defence area and the civil area should work together. One of the ways in which they could work together is through a defence diversification agency. I will not go into the detail because we do not have the time and most of it is in our evidence. But 10 years ago the management of the companies used to pooh-pooh that idea and talk about kidney machines from submarines and such nonsensical examples; but now they are beginning to listen. For instance, GEC in its oral evidence to the House of Commons Trade and Industry Committee enquiry into the aerospace industry said: "A UK defence diversification agency with adequate funding could give rise to immense benefits". Again, privately the big defence companies will tell you the same thing. That is because they have nowhere to go. Bits of them are falling off and being bought up by overseas competitors. Everything for British aerospace, for instance, depends upon the European Fighter Aircraft or the Saudi Arabian orders. Everything hangs by a thread, not only jobs but the whole future of the companies. So they are much more receptive to the idea of a DDA. In one of your questions you say, "Well, that is public money"—or something like that. It is a fair point. Why should we waste public money? It is the

[Chairman *contd.*]

question that is usually asked. In the study that we did together with the unions in 1992—it is on the final page in the appendix to our evidence to you—we do a calculation based on official and semi-official (i.e. City of London) figures which shows that there would be a peace dividend of over £30 billion totally up to the year 2000. That may not be entirely accurate today, but nonetheless it is easily perceivable to see that there is a peace dividend from the reduction in defence spending. What is happening to that peace dividend? The money that could be saved is basically being dissipated. A lot is going into redundancy payments to professional scientists and engineers. We are losing our professional scientists and engineers in the aerospace industry at a ratio of three to every one blue collar worker. There are now big redundancy problems among the key well trained and well educated people. So we have put forward a structure which we believe can be funded and can bring together the scientists, engineers and researchers in organisations such as the DRA, which we would see playing a pivotal role in the DDA, plus those who already work in the civil sector. Many of the large defence companies also have a civil sector, but there are Chinese Walls between the two. I will not quote any examples, but it is a fact. So we have to break down that, as I said. It would be nice if the big companies had a civil sector set up to bring their defence expertise into the civil sector and *vice versa*. It is not pie in the sky. All it needs is the will. The problem now is the problem of the will to do it. The technology certainly relates. Finally, let me quote from Robert Dankanyin, who is senior vice-president of Hughes Aircraft, which is the second largest missile manufacturer in the United States. He gave an interview in November 1993 to *Defense News*, which is the American defence journal. The question he was asked was: "What do you say to those in the defense industry who argue that diversification is difficult, if not impossible?" and his answer was: "I think that is the wrong approach. Certainly you can't change from making missiles to making something else, that part is true. But you can find the core competencies you have in the missile business that have commercial applications. When I started talking with my missile people, they said we could not commercialize. But I suggested that the same target recognition technology that we developed to enable a guided missile to go find a tank could be used to read handwriting. Similarly, the high-power switching technology that we developed for radar systems could be used for electric vehicles and other applications". I do not have the technical expertise to say whether he is right or wrong. But the attitude, as you will have noticed, has changed. That is what we are seeking to do, to mediate those attitudes through a structure such as the DDA. Short of that, quite honestly I have to say that I cannot see the Government at this point in time agreeing to that proposal. There has to be a series of possible secondments of people in the DRA into the private sector, so there is an exchange of technical and cultural expertise in those very specialist fields which will help us get through this dreadful problem of declining defence expenditure (and we are not seeking to increase it) with a declining industrial capability, which this country so badly needs.

305. Thank you for that helpful exposition. Do you see any model in other countries upon which you would wish to base the DDA?

(*Mr Webb*) There are parts of it in quite a lot of countries. Starting from the very basic principle that in tendering for defence procurement some countries, particularly America, have a requirement, or at least prefer, that defence tenders should have a civil application. In Sweden as well, for instance, there is a limit on how much a company can have in the defence sector. President Clinton himself has allocated large funds for the private sector which have been hit by the decline in US defence spending, also to use those public funds (which is not usual in America) to look at alternative civil products. There is no model anywhere that reflects what we say could be a possible structure—it is not set in concrete—but there are bits of it that exist in various defence dependent countries.

(*Dr Peeling*) I might add that the comment from the chairman of Hughes does not apply to DRA. Basically all our technology is core competencies. We are not interested in missiles. So there is a great potential for that. There is also a serious worry in the current pursuit of non-MoD business by the DRA that the DRA, unless persuaded financially to do otherwise, will pursue non-MoD business that is least risk and earliest gain. For example, at the moment the DRA are going heavily for consultancy business rather than spin-off into products. I am afraid that it is somewhat the British disease always to go for the service industry and not for the potential manufacturing industry. There is great potential that Defence Technology Enterprises could not tap which the DRA could tap if the financial framework was put in place to do the investment necessary for spin-off. But in leaving that to market forces within the DRA, you could not blame the chief executive for going for the low risk consultancy income.

Chairman] There are no further questions. We have kept you a long time. We are most grateful to you for the evidence you have given to the committee. Thank you all very much.

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MINUTES OF EVIDENCE

TAKEN BEFORE

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SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

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MINUTES OF EVIDENCE
TAKEN BEFORE

THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

(SUB-COMMITTEE II DEFENCE RESEARCH AGENCY)

Thursday 17 February 1994

Mr Nigel H Hughes

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THURSDAY 17 FEBRUARY 1994

Present:

Chorley, L.
Craig of Radley, L.
Hilton of Eggardon, B.
Howie of Troon, L.
Platt of Writtle, B.
Redesdale, L.
Renwick, L.
Selborne, E. (Chairman)

Dainton, L.
Dundonald, E.

Memorandum by Mr N Hughes

The following are my personal responses to the questions in your letter of 22 November.

1. The Defence Research Agency and its relationship with the MoD

1.1 *How independent of the MoD is the DRA?*

Not at all. MoD is now making it clear that DRA exists solely for MoD's purposes. DRA Senior Management have announced that DRA is not permitted to seek new customers or to take on work outside its defined remit.

1.2 *Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

The Trading Fund requires DRA costs to be determined against recognised commercial accounting rules and therefore enables more realistic comparisons to be made between DRA prices and Industry prices for the same work. It may make DRA appear to be more costly than Universites which may not be using such a proper accounting discipline. The trading fund per se should have no influence on the quality of research.

1.3 *How does the DRA's status affect its research strategy?*

The research strategy of the DRA is closely determined and constrained by the needs, policies and functions of its owner the Secretary of State for Defence. All other DRA Activities have to be conducted on the basis of use of "Spare Capacity". DRA cannot invest to provide new services to new non-MoD Customers.

1.4 *How has the MoD's system of Research Package Management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading Fund Status?*

NMS gives the MoD customers for Research and Technology a clearer framework for definition of their priorities and for controlling their budgets to meet those authorities. This should, in principle, interact well with the DRA Package Management system which is designed to enable DRA to format its research programmes to meet those customer needs. In practice, the pressure on defence budgets is such that the Research Customers in MoD may well find it extremely difficult to provide security of funding for those DRA programmes and tasks which are of an on-going or longer term nature. Short-termism may turn out to be a real problem.

1.5 *How will DRA's new status affect its relations with the MoD, other Government Departments and private industry?*

Trading fund status ought to provide DRA with a much more accurate understanding of its real costs and drive it to greater efficiency. DRA's owner has no remit to develop the health of the Defence Industry and DRA appears to have no authority to increase its work for others customers such as DTI, even if they had the funding. Although DRA now claims to be interested in "wealth creation" it is impossible to see how its status will permit this.

1.6 *How is formulation of a strategy for DRA being affected by post-cold-war thinking?*

The role of the Armed services is now more complex than in the Cold War. MoD needs to provide a wider range of capabilities, but is expected to do so at much reduced cost. The same will go for DRA, which will have to live with substantially reduced MoD customer income. The main effect of this will be that existing commitments to research expenditure will use up all the budget and there will be no headroom for new work. A major review of work will be required, leading to cancellation of substantial existing activities if headroom is to be provided for the new work required to respond to the new situation.

1.7 *The DRA role in providing Technical Services, particularly in War*

A major strength of DRA, by contrast with Industry, in the past, has been that it not only had the capability to perform theoretical studies, but also had the "industrial capacity" to perform full scale tests and demonstrations of concepts and systems. DRA strength was based on "having really done it". DRA is now transferring much of its previous industrial capability to Industry. While DRA knowledge may still claim to be based on practical experience, the industrial capacity from which DRA provided quick response hardware manufacture in time of tension or war will be gone.

2. THE DRA'S MANAGEMENT, INTERNAL AFFAIRS AND CORPORATE STRATEGY

2.1 *Will planned re-structuring and rationalisation affect excellence?*

DRA needs to strip out some baggage and its re-structuring will help. The budgetary challenges are now so severe that DRA will certainly lose quality and breadth.

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting-up of the Agency?*

Every Defence industry is having to downsize rapidly to adapt to the change in circumstances and budgets and faces the risk of loss of some critical skills in the process.

DRA should be expected to have to face a similar challenge, if the balance of government spending as between DRA and Industry is to be maintained. However, the retention of critical mass will not be possible in all areas. The DRA Alignment process, whereby Industry and DRA seek complementarity of skills, may help to maintain overall capability, but will result in MoD having to rely on both rather than having all its capability in DRA.

Speed of rationalisation has not been so much of a problem for DRA as the fact that MoD has changed its mind as to what it wants DRA to be.

2.3 *Staff Freedoms*

It appears that DRA will not now be encouraged to adopt a truly commercial style in competition with Industry. I suspect that this will result in the Treasury keeping a very tight rein on DRA's freedom to set competitive salary levels.

2.4 *Pathfinder*

Pathfinder is a good enough idea to be given a fair try. The recently announced Defence budget cuts will probably blow it out of the water by making it impossible for DRA to find financial headroom to provide for Pathfinder contracts.

2.5 *Identification of future needs*

DRA has some capability to perform operational analysis and presumably still has access to results of MoD's in-house OA. DRA is in close touch with the MoD Operational Requirements staff and should have as good an understanding as any of future needs. Industry is however concerned that DRA wishes to be the sole channel of communication between Industry and OR staff in MoD, thus removing a previous direct MoD-Industry link.

3. THE DRA'S RELATIONS WITH INDUSTRY, EUROPE AND THE WIDER WORLD

3.1 *Is enough being done to link the DRA's defence-orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?*

Technology is only truly Dual-use at the most basic material, device or component level. As soon as these are developed for specific operating environments, the resulting equipment becomes application-specific. DRA's most basic research is bound to cover dual-use technologies and can be spun-off at that level. However, such research consumes relatively limited resources relative to those for development of specific applications. DRA will not exploit its technology for civil applications unless funded substantially to do so. MoD customers will not see this as their remit and DRA appears to be discouraged from taking-on more DTI work, even if DTI could afford it.

3.2 *What are the conditions necessary for successful technology transfer from defence to civil?*

Technology transfer occurs through people carrying know-how. This can be done by transfer or secondment or by working together in combined DRA/Industry clubs. Technology exploitation, as opposed to basic technology transfer requires separate investment, as stated in 3.1 above.

3.3 *How does DRA connect to Technology Foresight?*

Not known.

3.4 *How effective are DRA's links with DTI and is there too little involvement of DRA in DTI's LINK scheme?*

As I recall, the LINK terms meant that if DRA was involved, this reduced the extent to which Industry's costs could be covered by DTI funding. This made DRA an unattractive partner in a LINK scheme and led to an artificially low level of involvement.

3.5 *Has DRA effectively filled the void left by the demise of DTE? Will DRA succeed where DTE failed?*

It was naive to assume that DRA technology would immediately be saleable to Industry. (See reply to 3.1.) DTE was never resourced to develop technology to the point where risks were sufficiently reduced for industrial exploitation. DRA has no budget to do that either. It is unrealistic to expect DRA to succeed in this.

3.6 *What is DRA's role in Defence Conversion and diversification?*

Defence conversion is a concept whose purity is unsullied by a single success. For the reasons already given, defence equipment does not match civil market needs. Neither is it realistic to put defence equipment manufacturers to work pushing technology which is not needed by the market place. DRA has no role in this impossible area. It does have a potential role in publicising new case technology and in fostering technology transfer and collaborative research into such new technology. The work of DRA Malvern some 10 years ago in hosting National Electronics Research Initiatives, with DTI funding and contributions of manpower from Industry, remains a good example of what can be done. Subjects covered were silicon hybrid microelectronics and pattern recognition. Both were of value to UK Industry.

3.7 *How should DRA relate to the part of industry which is not concerned with defence and how much should it focus on dual-use research?*

First part already answered in 3.6. There is no credible customer for Dual-useness. Customers are either Civil or Military. They have to have a meeting of minds to determine how much basic technology generation they will support and which parts each will sponsor. The result will be the dual-use technology which they together need.

3.8 *How is potential competition between DRA and private industry being handled?*

Ask DRA. The Trading Fund should remove most unfairness, provided that DRA is required to generate a commercial return on capital employed and cannot use part of its business to bid artifically low prices.

3.9 *What kind of relationship exists with the EC Framework programme etc?*

Not Known.

3.10 *Does DRA seek European collaboration as a matter of course?*

Ask DRA.

3.11 *Is there in other countries anything relating to the management of Defence Research from which UK could learn?*

The model of the Federally-Funded R&D Centres in the USA has much to commend it.

24th December 1994

Examination of Witness

Mr Nigel H Hughes, Smiths Industries Aerospace, called in and examined.

Chairman

306. Mr Hughes, welcome. We are very pleased you could join us. Would you like by way of introduction just to say something about your experience in these matters?

(*Mr Hughes*) Thank you very much, my Lord. Good morning. I would like to say that the evidence that I will be presenting this morning is largely based on my personal experience as the Chief Executive Designate and subsequently the first Chief Executive of the Defence Research Agency. As far as memory serves me this covered the period from roughly November 1989 to August 1991. Since May 1992 I have been Director of Technology with the Smiths Industries Aerospace Group. I am currently based at Cheltenham and responsible for overseeing technology and technology development across the Aerospace Group as a whole, which is in fact a multinational company, with assets both in the

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United Kingdom and in the United States. I am responsible also for the Central Research Laboratory of the Smiths Industries Aerospace Group, which is based at Cheltenham, which is the reason I am also based there, and am responsible for the oversight of that research programme and the matching of that research programme to customer needs, i.e. customers within Smiths. As a result of that, I maintain some contact with the Defence Research Agency, though for reasons which I might call reasons of decency I have chosen not to try and maintain too close a personal relationship with the Agency for the time being, because I felt my successor deserved a fair chance to run the organisation his way without the suggestion there was any interference or influence from myself. So my connections with the Defence Research Agency since I have been at Smiths are probably no more and no less than those of other colleagues in industry.

307. Thank you very much. Clearly your perspective is one of greater knowledge about the DRA than many because of that helpful background. I think that leads me to ask the first question. In your written evidence—and thank you for submitting that—you state that the Ministry of Defence has changed its mind as to what it wants the DRA to be. Perhaps you could explain in what sense that is so?

A. My Lord Chairman, there is a very short answer to that and perhaps a somewhat longer one. Let me give you the short answer first. In short, the remit which I was given on appointment as Chief Executive Designate to the Agency was to move the Agency as rapidly as possible towards a commercial style, and at that time also to subject as much as possible of the programme to competitive pressure. So in a sense competition was everything when we started. Now, from what I observe, competition, certainly competition with industry, is being played down a long way, and I concluded or considered that that represents a significant change in the requirement for the style of the Agency.

308. Would you like to indicate whether you think that is a desirable change, or whether you feel the original brief was probably right?

A. If I may, my Lord Chairman, I would like to go through some of the background on this in a little detail. I think this will be helpful to the Committee as it indicates the various forces and arguments which were at work. At the time that he joined the Ministry of Defence, Peter Levene, later Sir Peter Levene, was of course appointed as the Chief of Defence Procurement and he was then, fairly early on, exposed to what we knew as the CERN facilities, i.e. the facilities run by the Controller of the R&D Establishments, Research and Nuclear—not to be confused with CERN in Geneva you understand. Those are the facilities which essentially now comprise the DRA. I think his view was that the programmes that they conducted and the facilities they provided were of great value to the Ministry of Defence and in particular to the Procurement Executive; however he made it very clear that his attitude was, "Yes, I would like to use them but why should I own them", and he wished in a sense to distance the rest of the Procurement Executive from the R&D establishments. He felt very strongly I believe that the Procurement Executive should task the establishments but should select whether to obtain services from the establishments or to obtain services from industry on their own judgment, in other words the idea of a competitive relationship was emerging at an early stage. Fairly early also in Sir Peter Levene's time with PE, the Controller of Research himself began to explore with his senior management staff the sense of direction of the R&D establishments. There were a number of frustrations associated firstly with the fact that the establishments were financially controlled on the Vote, as it is called—they were Vote-funded. This was perceived by the staff as giving them limited budget flexibility, perhaps artificially limited in terms of resource allocation and re-allocation; they were clearly tied to Government pay and conditions and they saw no encouragement to them to either dispose of assets to re-invest in the business, as it were, because there was no certainty that asset disposal would give them any funds, and neither did they see any great advantage to them in exploiting their intellectual property, for example, by selling IPR or services to industry. There were therefore views within what is now the Defence Research Agency that there could be some advantages in some kind of commercial style of operation and in so-called commercial freedoms of operation. The staff also saw, I believe, at the time the desire to have an ability to influence their own future to a degree. They had been subjected historically to very substantial reductions in funding and in staff numbers over the years (I think I can remember a 3:1 reduction cumulatively in my career, perhaps more). In those days they felt that if they were able to capitalise on their services and intellectual property they could perhaps arrest that decline which they genuinely believed would be for the benefit of the retention of capabilities, services and facilities for the United Kingdom technology base, and so there was a feeling that some change in style could be helpful. This then moved into the era of Sir Robin Ibbs' "Next Steps" Report, the notion of the creation of Agencies, and a number of these thoughts came together, and it appeared that the more that a Defence Research Agency could be set up with a commercial style and subjected to competition, the more it was likely to be granted the management freedoms and the accounting freedoms which would allow it to take some charge of its own future. Indeed at that time, I recall the Minister for Defence Procurement in a private interview with me saying "yes" to competition and indeed "the more competition the better", and certainly the arguments that I was hearing from the Defence Department and the Treasury were very much, "If you do not get the majority of your programme subjected to direct head-to-head competition, then you will not get the kinds of freedoms and flexibilities you are looking for." Furthermore, at that time, the Civil Service College was setting up training programmes for would-be chief executives within agencies and for senior staff within agencies, and very much the line they were pursuing was that of developing a vision for the agency, and that was a vision which implied success however measured, and they were presenting would-be chief executives with examples from

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industry of how various industrial operations had been turned round and had become more successful in a competitive world. I remember us receiving a presentation from Rob Wilmott, ex-ICL, and being impressed by the fact that he had achieved a 10 to 1 improvement in return on capital employed. There was much talk of delayering and streamlining. Examples like Abbey National, with great sensitivity to customer pressure, and Halfords' changing image were presented to us. The basic message was, "Be bold and go for it." That essentially underpinned the notion that agencies were to be encouraged and adopt a commercial style; to be street-wise in the market place and to take charge of their own futures. Set against that, there was another camp, if you like. There were other voices within the Ministry of Defence who were arguing that this was an excessively risky approach. There was the risk of loss of critical national capabilities if, indeed, customers were not found to support those. There was recognition and, indeed, there had been recognition, even in the "go commercial, be bold" mode, that certain of the Defence Research Agency's functions were essential to the Ministry of Defence, those particularly associated with the nuclear programme, intelligence support and national security in general, which would have to be protected in some way and provided for. But within the second camp, as it were, there were those who were concerned that the commercial style was going too far and too fast. There were arguments saying, "Be cautious. Take it much more gently. Preserve what you have got." Those arguments were, perhaps, most succinctly put by the Chief Scientific Adviser at the time, Sir Ronald Oxburgh, whom I believe this Committee is due to see, who started an argument from another end saying that Agencies are owned by the Secretaries of State of their parent organisations. The DRA would only exist if the Secretary of State for Defence wishes it to exist. Therefore, its purpose is to service him and his needs only, and the pursuit of other programmes and other customers is secondary to that. Also, overt competition with industry will be counter-productive in terms of the ability of the agency to exploit its discoveries for the benefit of the Ministry of Defence. So there were two camps in the early days. The competition camp was winning the argument, but latterly I sense that the argument I attributed to Sir Ronald Oxburgh won the day. I think, my Lord Chairman, that is a long way round to answer your question and I apologise for that, but it is, perhaps, necessary background. I think it is possible that in the economic conditions under which the Defence Research Agency was conceived in which industry was growing quite rapidly and in which there appeared to be a growing market for technology generated to the United Kingdom—a growing market for the kind of services the DRA could provide—that the competition commercial model could have been viable. However, I suspect that under the current economic conditions the effect of adopting that economic model would be extremely severe.

309. That is a very helpful explanation as to how you perceive things have changed from the early days. Have you had an opportunity to look at the more recent framework documents under which the DRA now operate, and compare them with the framework documents in your time, which was 1991?

A. No, my Lord Chairman, I regret I have not seen those.

310. Would you expect there to be a change of emphasis on this attitude to competition and any other area?

A. I detect from presentations to industry that I have attended that there has been a change. The emphasis which I was effectively instructed to put in place on primary head-to-head competition with industry for the majority of the programmes has certainly gone. The notion of head-to-head competition appears to be quite attenuated and, indeed, the Agency appears to be proposing to operate much more on the basis that it will place contracts with industry to support the services that it provides with the Ministry of Defence. Those contracts will be placed on a competitive basis and the performance value—if you like, the value for money delivered by industry under those contracts—will provide some sort of yardstick against which the performance of the Defence Research Agency in delivering its services can also be compared. I should say that this comparison was not possible in the past when the Defence Research Agency and the previous CERN organisation was vote-funded, because the accounting requirements for vote-funding merely effectively accounted for running costs and did not give a proper assessment of full cost. So the fact that the Defence Research Agency has now become a trading fund, and is now operating a full set of commercial accounts, does, at least, enable the Defence Research Agency's performance to be compared against commercial performance on more even terms. I see no disadvantage in that, incidentally.

Lord Howie of Troon

311. I wonder if you can tell me—you have spoken about a change of mind in the MoD—what is that change of mind? Was that your reason for leaving, or was there some other reason?

A. I am not sure so much that it was a change of mind. I think that everyone—

312. But that is what you say, is it not?

A. My Lord, let me clarify. Every government department faced with the challenge of launching an agency had to make up its mind as to what it wanted that agency to be. I do not believe that the Ministry of Defence was unique in finding that difficult, but it was clear to me, in my time, both as Chief Executive Designate and latterly as Chief Executive, that the MoD had not fully succeeded in clarifying its vision of what it wanted the DRA to be. By definition, therefore, there was not a clear shared vision between the MoD and the DRA. Now, with a clear shared vision, it is much easier for a chief executive to know whether he is delivering or not. However, in answer to your question as to whether my departure was in any way associated with that, it was fairly clear to me that when the competition was run for the post of Chief Executive Designate (and I applied for an openly advertised post), this competition was seeking

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applicants from industry as much as—and possibly more than—from the Civil Service. The post was not candidly advertised at a particularly high salary—not what industrial chief executives would regard as a competitive rate—and I sensed at that time that whilst the MoD probably wished to have somebody with direct commercial and industrial experience as the Chief Executive Designate, no suitable candidate was forthcoming and I was the best of the official candidates. I was very keen to do the job. I was very excited by the prospect and I determined to do the maximum that I could to move the DRA towards a successful launch—and a timely launch—in the best conditions that it was possible to have it from the point of view of its financial accounting systems and its operation. In the event, things moved more slowly than I think I had hoped they would, perhaps believed they could—it took us longer to get our financial systems into order and so forth—and there may have been an element of frustration within some quarters of the Ministry of Defence that we had not been able to move forward more quickly, I do not know. But it is only fair to say when I was appointed Chief Executive Designate it was made clear to me by the Ministry of Defence that there was a likelihood the job would be re-competed when they required a substantive chief executive, and I think that was in part to keep open the option that by redefining the terms at some suitable stage they could in fact get an industrialist in to run the Agency.

Lord Craig of Radley

313. In your note you may recall you said that DRA had some capacity to perform operational analysis, and the Committee would be interested to hear your views about the division of responsibility, as it were, between DRA on the one hand and DOAE, or DOAC as I think it now is, on the other.

A. I certainly felt very strongly throughout my research career in the CERN organisation that it was vitally important that the DRA, as it now is, should understand enough about operations and be capable of analysing operations sufficiently well to (a) really judge and rate the performance of the systems and the technologies that it was developing and (b) be able to provide the operational requirements staffs with good evidence as to the operational capability of particular weapons systems. So I think OA is necessary to the DRA for two or three reasons. One, it is necessary for the DRA to understand the language of the Services and those who are actually responsible for operations in the Services, otherwise they cannot possibly serve them as a customer, so they need to understand the language; they need to be able to measure the in-service performance of equipment and of proto-types sufficiently well to judge their impact on operational effectiveness and, as I said, ultimately to support the operational requirements staffs in putting forward cases to central committees for the procurement of either further existing systems or the development of new systems. They need to do all of that. That keeps their kind of operational analysis relatively close to specific types of hardware. While I was responsible as Deputy Chief Scientific Adviser for oversight of DOA at West Byfleet, the kind of work they were doing was distinguishable and reasonably distinct from that and was much more associated with a higher level of operational analysis, asking questions about the kinds of forces and the kinds of weapons systems which would lead to the greatest effectiveness for the United Kingdom and the United Kingdom in alliance with NATO. So it tended to be looking at war games which involved conceptual weapons at a fairly high level and looking at the size of force which might be effective, looking for the trade-offs between, let us say, armed helicopters and tanks as anti-tank weapons and so forth, and, dare I say, occasionally looking at the trade-off between air power and ground power or air power and sea power. Those high level broad studies were not appropriate to the DRA because the DRA was, and I suspect still is to a degree, organised to group systems areas specialisations together, so the sea systems people really made it their business to know the detail of sea operations and of contribution of equipment to those, but would not have been well-placed to try to make a judgment of the relative balance of sea systems versus air power, for example, which I do believe is a question which needs to be examined from time to time, and I think you probably need an organisation with a different perspective in order to advance that kind of cause.

314. That organisation you would not see as being a part of the DRA, I would gather from what you said?

A. I do not see why it should not reside under high level DRA management. Or do I? Permit me, my Lord, just to think about that one for a moment. On balance I do not see why, if it were organisationally convenient, it should not be handled under DRA management in the sense DRA is a tri-Service organisation, supporting all three Services, so it does not polarise: I do not think it can be accused of polarising the work of DOAE in favour of any particular Service. DOAE, as was, however attached a great deal of importance to its "independence and neutrality" and found that it needed occasionally to have that direct line to the MoD centre, the Chief Scientific Adviser, which allowed it to take perhaps a less than palatable stance against one Service, or one type of operation in one type of Service, as opposed to the other. DOAE tried extremely hard to get agreement to the assumptions and terms and conditions for each study in order that the results of their studies would be acceptable, but still occasionally found itself being caught in a sandwich between two factions. I recall, for example, great debates about above-water as opposed to under-water investment in the Navy, and DOAE found themselves, having done some studies, pushing in a direction which clearly could not please both parties. I think they felt that some allegiance to the Chief Scientific Adviser perhaps gave them greater power, perhaps greater closeness to the Secretary of State, than if they had had allegiance to the Controller of Research at the time, but I do not think that would be unmanageable, frankly.

Baroness Hilton of Eggardon

315. Pursuing rather a similar sort of theme, in your written evidence you say that industry is concerned that DRA may become one channel for communication with the MoD. Has that concern been borne out in practice or is that a vague anxiety they have about what is happening?

A. I attended the first Pathfinder Conference at Malvern; my deputy attended the second one. In those conferences the Chief Executive of the DRA made, certainly in the first one, a very explicit statement that it was his intention that industry on research matters (and I think we may have to ask what we mean by research matters) would effectively be dealing through the DRA rather than with the Operational Requirements staffs themselves. I think industry is legitimately concerned about that. The Operational Requirements staffs in their role need several sources of information. In the simplest terms I see it as their job to track where the threats to the United Kingdom interests are going, i.e. to be aware of and understand intelligence projections in the areas which matter to us as a nation, constantly to be assessing and projecting the effectiveness of the equipment, the manpower and the training that we have in place to address those threats, and identifying gaps. Having identified those gaps, I believe it is essential that they should be able to make a judgment as to whether procurement of more of the same is the best way of filling that gap, or the development of new systems. Essentially the ultimate product of the Operational Requirements staffs is the operational requirement that says, "We have a case here to procure more of these or to develop something else" and in that final stage saying, "There is a threat emerging that I cannot adequately match with the forces and equipment I have in place and I now wish to do something better." They clearly need to have an understanding of what is in the pipeline. They clearly need to understand what is on the shelf and, believe me, my industry colleagues are constantly bombarding them with literature on that, but they also need to know what is coming along. Since the DRA by definition is not conducting all the research and is not performing all the technology development relative to all the needs of the defence of the realm, then industry must be a substantive source to OR of some of that information. They have been tapping that source in the past, they therefore do have the capability now and I see no reason why their role and the nature of the OR animal should have changed. I believe they are perfectly competent to have that kind of dialogue. Of course the advantage to industry of (a) feeding information in and (b) receiving feed-back from OR is that it gives industry a first-hand feel for the direction of operational thinking. Industry needs that if it is going to make its own investment for the future wisely because it needs to have some sense of where its major customer is going.

316. Do not the OR staff need technical and scientific knowledge to make appropriate decisions about industry, and, as the DRA is more divorced from the MoD, where are they going to seek advice about which bit of industry they should be talking to?

A. I see nothing at all wrong—in fact, it is a great advantage—in OR maintaining a very close dialogue with the DRA. I never questioned the fundamental role of the DRA in providing technical services and advice to OR, to allow OR and PE to be intelligent customers for future systems, but I would hope that the DRA would never have drifted too far away from that kind of role. I would become nervous if that were to be the sole channel because the only way then that industry could feed a view in would be through the DRA, and industry might well then get nervous about whether DRA was, or was not, putting a spin on the information.

317. That is one danger. The other danger is that the DRA gets so divorced from the MoD that it can no longer provide that technical background, and then the MoD becomes subject to hot sells by industry, does it not?

A. I would neither advocate total reliance on the DRA nor total reliance on industry. I see the optimum solution being the maintenance of both channels. Therefore, I support those who are nervous lest the DRA should move in the direction which distances industry further from what it believes is its end customer. It is not a bad principle that industry should stay close to its customer. Its customer is, by and large, not the DRA, so it seems to me there just has to be a balance. I can see the advantage to DRA of being the total channel for information, clearly, but I think that is unrealistic.

Lord Dainton

318. Mr Hughes, I have listened and also read what you have said. I have the feeling that the DRA is in an extraordinarily difficult position in that it has a primary duty to serve the Ministry of Defence, clearly, and one tends to regard that as its main activity; but, at the same time, there is also generated a feeling that it is a resource which is, perhaps, too large for its country's needs at the moment and it ought, therefore, to be getting out and doing other things because that resource is of high quality and it would be helping British industry, although, in a curious way, if it goes out into the market place it is competitive with industry. So you have really three ways of being pulled: one by the Department, one going into industry possibly to help it (but which, indeed, in this day and age may be regarded as a hidden form of government subsidy) and, at the same time, wanting to earn money by going into the market place, where it is bound to compete with other, or possibly with the same sections of industry. Can you give us a clear steer through this particular field?

A. My Lord, I wish I could. I wish I had been able to in former times. The novel element to this is, in fact, the element of competition. As I said earlier, my perception is that this is being played down significantly. Indeed, there was, perhaps, to clarify a view held, which I attributed to a former chief scientific adviser, who effectively said the DRA needs to conduct and perform just that research and that technology development which enables it to be a professional and intelligent adviser to its customers in the MoD. That is that: then let us tie the ribbons on that one. That is about the cleanest definition that you can get. In the past, the R&D establishments managed to blend with that—I do not like to use the term "support for industry role"—but they blended

[Lord Dainton *contd.*]

with that the oversight and steering of government-funded programmes which were aimed at enhancement of the United Kingdom technology base in general. Those programmes only existed—and, I suggest, should only exist—where there is, indeed, a ministerial will to encourage or develop an area of technology. An example in the past was the Alvey programme which was aimed at developing and encouraging the exploitation of very large-scale integration of semi-conductors. The decision to pursue that programme was, I believe, taken at Prime Ministerial level. I am not certain, but it was certainly a very high level decision in government. It involved interests from the MoD, the Department of Trade and Industry and the SERC, the Science and Engineering Research Council, at least. It may have involved others, but I know it involved them. The R&D establishments in the Ministry of Defence had been influential in setting the technical objectives for that programme, largely in discussion with their colleagues in the DTI and in universities, and were actively involved in parts of that programme. I was in the research organisation at that time. I did not see any difficulty with that. It was a government-funded programme designed to develop a technology and find paths towards its exploitation. It represented interests both of commercial and military sectors. The programme was broken down into objectives which both parties were able to agree and that was relatively tidy. I think it is quite possible for a DRA to be put into a reinvention of that world. None of the Alvey programmes, in my mind, detracted from the ability of the R&D establishments to provide intelligent and professional advice to the MoD. Indeed, it directly added to it. It added to its knowledge base. The information that was generated by the DRA was known throughout the community which was conducting that programme and, therefore, was potentially available for exploitation through the industry channel, and that seemed to me to be quite reasonable as well. The dimension that does make life difficult is the dimension of head-to-head competition, but to the extent that it is minimised, then I do not think the position of the DRA becomes untenable. I would not remove the possibility of DRA ever being involved in any competition in any area. I say that because there was a time when the R&D establishments, having had very heavy pressure put on their budgets, were being forced down to a lower scale of programme, and were no longer able to meet the demands from some of their Ministry of Defence customers. They were locked into a budgetary control mechanism that did not allow them to say, "We have customers out there that actually want more. Let's go and do it for them." They were resource-limited and industry was brought in to perform some of the functions. They were providing some form of analysis and study. Industry was brought in, as it were, because the R&D establishments were not permitted to have the resource to do that job. I felt slightly peeved at that, I might say, and would not have objected to a situation where had I won a competition, I could have got the resources and could have got the money to provide services to that customer. Within certain limited bounds, that might still be valid.

319. There is another way of looking at this problem, of course, which your own career exemplified, in that you run down resources because government no longer has the need for such large expenditure in the defence area and the people who are in those activities—who have ideas and knowledge, as it were, on the hoof—do, in fact, move out into industry. That way you get a transfer into industry of the knowledge without the competition. Is there something wrong with that? You have done it yourself, have you not?

A. There is nothing at all wrong with that. I may be jumping the gun but referring to one of the later questions from the Committee, there is a question about the Joint Research Clubs and perhaps I might move on to that to provide a specific response? There were running at the time I was Director of the then Royal Signals and Radar Establishment at Malvern, which was just prior to my becoming Chief Executive Designate to DRA, a number of things called national electronics research initiatives. These were formed, firstly, by the Establishment identifying leading edge knowledge, research knowledge, which it had generated, that it was prepared to put on the table as a sweetener to encourage industry and university representatives to second people into a common unit to pursue various things, and three of the major activities were associated with pattern recognition in general, if you like, machine vision; machine intelligence, particularly geared towards speech understanding systems; and what we now call multi-chip modules, which is essentially where a large number of separate, integrated circuits are assembled together into one package to deliver far more power than is possible from a single circuit. Smiths Industries was involved in two of those areas for certain—the machine intelligence/speech recognition area and the multi-chip module area—and we actually seconded people into those programmes. The programmes worked together, collectively generating intellectual property which was shared by all the partners, up to a point. The programme stopped when they reached a point when significant further investment was required in plant or machinery to produce actual devices or actual systems. At that stage the combination of the concern over shared property, the lack of competitiveness if you like, associated with the fact one was forced to share the output, combined with the increasing entry fee caused these programmes to stop. I believe, with hindsight in fact, that they stopped at the right moment, because we, Smiths, took away our speech understanding knowledge, took the person back, kept the experience and know-how track in one piece, and we currently have a speech understanding system—installed, if not yet flown—in an AV-8B Harrier in the United States for the US Marine Corps, and we expect to exploit that technology in other ways. On the multi-chip module technology, our people maintained the know-how trail on a personal basis, and we have a small division called Micro-Circuit Engineering, which is actually active in manufacturing multi-chip modules, exploiting that technology.

320. What financial recompense for its input into this did DRA and Smiths get?

[Lord Dainton *contd.*]

A. I regret, my Lord, I do not recall the precise funding mechanism. I know that industry was expected to make a contribution. In effect I believe that it was a 50-50 government and industry funded programme, and that the government 50 essentially was given to the DRA, was part of the DRA budget, the RSRE budget at the time, and that provided for the generation of their intellectual property and some of the common laboratory facilities that we used. Industry effectively provided its input in manpower terms largely, though I believe there were some cash payments for facilities.

321. But ultimately this results in sales, presumably? Say you are successful with the US Marines, will any of the ultimate sales profits accrue to DRA because of its work?
A. Not as I recall.

322. How then can DRA go into the market place or be said to be in it?
A. On that model, the model was one of, dare I say, providing support to industry to exploit intellectual property. The intellectual property which was held in common by the group clearly had value but was not valued in a formal sense. It was possible for any member of the team to leave with his share of that intellectual property at any time and then go away and add his own intellectual property to generate a product. I do have to say at this point that having seen the picture from the other side of the fence in industry for a couple of years, it is always true that the expenditure on the base technology, if you like the basic know-how, is small by comparison with the expenditure on the development of a specific product. If one were in any sense to apply some kind of exploitation levy in proportion to the amount of money invested, the amount of money which was invested in these clubs was very small by comparison with the kind of investment industry subsequently has to make to make a commercial sense of the items, so I do not think it would seriously unbalance anything. Nevertheless it was a jolly good way of getting a number of partners up to a high standard of competence in technology.

Earl of Dundonald

323. First of all I should declare an interest at this moment in time because you have touched on speech recognition and I am a director of Forum Technology which currently has a joint venture arrangement with the DRA at Malvern. I was surprised Smiths have not come to some form of royalty arrangement with the DRA, because in our experience on the technology which was developed from the Armada System which Malvern developed they have certainly reached an attractive arrangement with the company I am involved in, in that if the technology is successfully delivered to market they have some sort of a royalty. I wanted to pick that up because I think it is surprising that Smiths have not got that sort of arrangement. I would have thought it would be very important for the people at Malvern to feel they were benefiting from all facets of the technology they helped develop?
A. Yes. You may not be surprised to hear that this is a question I ask my own research staff from time to time. At the time we extracted what will have been the common technology you similarly exploited (we will spare the Committee the jargon) that technology was taken away by one of our people who then added his own intellectual property to that, and we have been moderately successful in tailoring the technology we had and developing it on our own funds to match a very particular kind of market. I suspect you too will be finding speech technology needs to be tailored rather carefully to the application. That has been sufficient for us up to now. I, as Director of Technology of Smiths Industries Aerospace Group, certainly do not exclude the possibility that having developed the technology as far as we have, in order to develop it further we need to go back to the well and that might be under a commercial relationship; I certainly would not exclude that. We are retaining an element of contact with Malvern sufficient, I believe, to track where they are getting to and allow us to take a decision at an appropriate time. The fact is, however, that our commercial judgment has not led us to take that decision thus far.

Lord Redesdale

324. I was wondering whether there is any benefit in the R&D Centres in the United States, and whether you believe that if the same system was employed here the funding would mean that these centres were tied through research to the requirements of the MoD, and would the MoD then remain the customer?
A. I did, in fact, spend some time when I was Chief Executive Designate to the DRA examining alternative models. There was a lot of examination of alternative models going on—government-owned, contractor-operated, full privatisation, operating on the vote, trading funds, and so forth. We were able to obtain a very full transcript of the rules under which the federally-funded R&D centres of the United States operated. To many of my staff, they did seem to be a model worth looking into, although those winds were not blowing in this direction at the time. In short, as I recall—and may I say that if on this part of my evidence I turn out to be inaccurate I will submit some subsequent written information to the Committee because I have been out of my office for a week and have not been able to catch up on this—federally-funded R&D centres in the United States exist where there is an identified government need for some activity; where the government has identified that need to industry and given industry the opportunity to offer and respond to their need and where there has been an inadequate response. An example, which still survives, was the early days of the US nuclear programme, where industry was not able to set up the Los Alamos laboratory on its own. It had not got the capability. This is rather gross example but they exist where there is a need, where that need is not met and after open advertisement and open competition, where the need is not met or capable of being met by industry.

Chairman

325. May I just interrupt you there? Is it not the case that the American Department of Defense have a very much wider remit of wealth creation, and

[Chairman *contd.*]

helping the underpinning of industry is something they take very much as part of their role?

A. My Lord Chairman, they do, but it was not a major factor, I believe, in the creation of the FFRDCs. It is a factor in the way that the Department of Commerce operates today, and it is a factor in the way that the Advance Research Projects Agency now operates. For the FFRDCs, initially the question was: is there something that government needs and industry cannot provide? Therefore, I think there is a closer analogy with the basic role of the DRA. An appropriate government department would be chosen to sponsor a FFRDC—the Department of Energy in the case of nuclear establishments. They were government-owned, they were contractor-managed (indeed, they are contractor-managed, generally speaking) and they operate upon a commercial accounting basis. Their programme and their performance goals (efficiency measures, if you like) are set in advance for a period, which I recall as being something like three years. I am not certain. They are set up to perform a specific task. At the end of the period, where they should have completed that task, their continuation is reviewed. They have no right to continue in existence, but they do have the advantage of relative stability in the programme over the period that has been approved. Those are quasi-competitive. There are, at least, some real pressures there that government control those organisation, but they are not required to demonstrate their competitiveness by competing with the private sector, once formed. Competition is once-and-for-all at the formation point and subsequent reviews, if you like. They are permitted to take on a certain amount of external work. Their percentage is limited—I do not recall the percentage—but 20 per cent is the sort of figure I have in mind. I believe also that they are able to retain revenue from external work they take on, but I do not know, to date, whether they are permitted to seek government investment in major facilities to allow them to take on government work.

326. So clearly the accountability to Parliament, which the MoD is required to exercise, makes such a project impossible in this country. You cannot spend MoD money on something which does not basically defend the realm, can you?

A. There might well be limitations, I suspect, on the government department being able to fund infrastructure for non-government purposes, yes. As regards the rest of the model for the FFRDC, I cannot see why that kind of model should not have been considered. It provides an alternative balance to the other models we have looked at, between the tension for efficiency and tight-tasking and the freedom of the organisation.

Lord Chorley

327. I wonder whether we could go back. We have spent quite a bit of time talking about competition and the DRA situation *vis á vis* industry. In your answers, particularly to Lord Selborne's first question (and I think also, to some extent, to Lord Dainton's) you really played it down. You said it was developed differently and was not too much of a problem. British Aerospace have made the same point. That is to say, the point that they have got a tripartite role as advisor to customers in industry but also as competitors to industry. They seemed to be concerned (to the extent that there is still concern) in the notion that the DRA put up Chinese walls as a mechanism. Is that something which you think has much use? Commercially, in fact, you probably created the Chinese wall!

A. I may have had something to do with that. I certainly recall the expression.

328. It is well-known in the industry.

A. It is a common experience for industry to have to segregate rigidly the intellectual property owned by, or provided by, its various customers. My company would absolutely expect to segregate proprietary information from Boeing, which is one of our customers, from the proprietary information of Airbus. So it clearly can be done. Mechanisms similar to those which are used to segregate various classifications of defence information can be put in place.

329. Just to interrupt: to the extent, as you say, industry understands these Chinese walls, would that approach, therefore, alleviate the fears of British Aerospace?

A. There are two issues here. One is how the walls are constructed. Sometimes the Chinese wall process actually requires that staff will only be engaged on one kind of programme for one kind of customer and must positively be prevented from being involved in programmes for other customers for a period of (say) sanitisation—a cooling-off period; but they are all parts of the machinery. The bottom line is that the uncertainty that is in the mind of industry is a legitimate uncertainty associated with the lack of experience of operating in this new kind of regime. If, over a period of time, the DRA is seen to behave impeccably in relation to the protection of customers' intellectual property, then, in time, it will become fully trustworthy. The fact, however, is that it started by projecting a fairly aggressive, competitive and commercial image—and I was responsible for that. This has inevitably raised greater uncertainties in the mind of industry, and those uncertainties will take rather longer to evaporate. However, the DRA may now be behaving.

330. I think this is rather helpful. Another angle to it, which was put to us by Smith System Engineering—

A. We have no connection with the firm next door!

331.—on the IPR point, was, namely, why should not the benefit of IPR from its exploitation go to the MoD rather than the DRA? In other words, is that a feasible thing or not?

A. With a slight reservation. The MoD might be concerned, if it would work, why it should not go to the Treasury rather than the MoD. To the extent that the DRA operates as a commercial organisation, in the sense of being expected to deliver a return to the investor, if it were genuinely set up as a profit-making organisation delivering profit to the MoD, then there would be no argument and it would all be part of the same bottom line and it would all automatically flow back. My understanding is that while "profit" is a

[Lord Chorley *contd.*]

notion which might be now used for some kind of performance measurement of DRA for determining effectiveness, the DRA is not in effect required to generate profit, and the MoD does not therefore see itself as a set of shareholders in that sense. I am not well-briefed on this, I may be wrong on this point. I think it is a moot point as to whether the MoD believes that it owns and operates the DRA in order primarily to reduce costs or whether it is designed to improve the quantity of knowledge and technology which is generated from a pre-determined budget. If the latter, then the receipt of funds back into DRA for exploitation of its intellectual property, which either allows DRA to be larger or better equipped, would be the correct solution.

332. In any case, much of this IPR is probably not in a sense exploitable, rather like your early days in speech recognition. So it may be a non-starter for a lot of this; it is perceived conflict.

A. While there are cases where inventions and discoveries in companies and organisations have provided very major revenue streams over the years, my belief is that these tend to be the exception rather than the rule, and the amount of income one would get from the licensing of intellectual property would be relatively small. Primarily one is talking about a licensing operation. There are occasionally things which hit the headlines, and I think auto focus was an example—I forget who invented this but the technology which is used very widely in Japanese video cameras and cameras for automatic focusing was generated by a US company and they held the patent on the technology, the patent was being infringed, and a major payment or settlement, major revenue, resulted from the challenge on that patent infringement. Those hit the headlines and one is beginning to talk about millions and millions of dollars associated with the major cases, but I think you would be very lucky indeed to achieve something like that.

333. You mean they get dealt with *ad hoc*?

A. Absolutely. I never saw IPR exploitations being a major revenue stream but it is a major motivator actually for people. It is one of these things which gets the individual scientists quite well switched on, the idea they not only have their name on a patent but it is making some money for somebody is quite a reward in its own right. I think it is worth pursuing for that reason actually, if no other.

Lord Dainton

334. I was thinking of AEA technology while you were talking. Why does not the DRA float off, as it were, an activity, a section of it, which is ready to be in the market place? Is that not a possibility.

A. Two answers to that.

335. Which one is the right one?

A. Looking at it again from the other side of the fence, from industry, the decision to do something like that is always a business decision. It is based on a judgment of the effectiveness of the floated-off operation rather than keeping it within. It is based on the market assessment for that operation, it is based on the assessment of the cost, it is basically a return on the capital employed. I do not know whether the DRA's charter allows it to do that kind of thing—if it does I would agree with you, why does it not—and the answer probably is because it has not seen a good enough business case. The answer should be that it has not seen a good enough business case.

Lord Dainton] There is a very strong feeling in the country that there is a lot of expertise "locked up"—and I do not mean that in any rigid sense—which could be put to greater advantage for UK Ltd.

Chairman

336. Or there might be other mechanisms which might prove more effective for moving into the industrial sector?

A. The only effective mechanism for moving intellectual property from one place to another is a continuity of the knowledge trail, and that means people, the point I think you made earlier. The only kind of intellectual property which can generally be moved about at that level is pretty basic, it is fundamental know-how, it is not the direct solution to a design problem for a particular piece of equipment. Just as MoD finds the ratios between research expenditure and development expenditure are enormously heavily biased towards development, so does industry. This is a fundamental truth. Basically, if you can achieve continuity in the knowledge trail and not suddenly throw that away and jump in another direction, then you may minimise the risks associated with your major developments, and that is where you save the money. That essentially is a challenge to the Ministry of Defence just as it is to everybody in industry, to bring a product to fruition with acceptable development costs. DRA is not a development organisation, there is a residual value in the intellectual property which could be transferred or could be generated in technology clubs involving the DRA, transferred into industry. It would be foolish however to assume that even if that is done successfully, that actually yields products on the shelf; it certainly does not. One is talking about hundreds of times more expenditure to get something into the market place. So the revenue resulting from licensing all or part of the technology legitimately might be quite small.

Baroness Platt of Writtle

337. We heard from the DTI that there might be a need to look at the LINK rules again. The MoD have suggested that the fact that the DRA contribution counts towards the Government share, leaving the balance to be found by industry, can put off collaborators.

A. That is correct. That is my understanding.

338. How would you feel about the DRA being viewed as a trading fund and as an industrial partner?

A. I think there were two issues associated with difficulties on the LINK programme. As I recall, LINK associated government, industry and academia, with each in a sense making a contribution. There was a concern, and I think there still is a concern, in industry that industry puts forward costs based on a truly economic figure, a full commercial price, and there is some question whether the university prices for their work were necessarily

[Baroness Platt of Writtle *contd.*]

calculated on the same basis. I know they should be, but industry is still unsure as to whether they are, looking at what they appear to be offering for the same money. So there is a sort of built-in imbalance there. Yes, the involvement of a government R&D establishment, biasing the thing away and making yet less money available for industry, made government R&D establishment support—DRA or RSRE as they were in past years—less attractive partners. In other words, what the government establishment had to be able to offer was something absolutely fantastic in terms of an intellectual contribution, out of all proportion to the cost, if it was indeed to be an attractive partner. I think that is a little unrealistic and I would agree with you that somebody needs to look at this. Not that there is anything wrong with the notion of this partnership; the notion of there being a technology transfer partnership seeded by government, involving universities and industry is the right way to do it. It is one of the necessary bridges, it is just the LINK rules seem artificially to have kept the government R&D establishments out of it, simply as you say because of the way the mathematics work.

Lord Craig of Radley

339. You, and others, have touched in your comments on the loss of industrial capacity within the DRA, because of it being transferred to industry, and that therefore there is effectively a reduced capacity for the DRA to respond in a conventional way. The customers' concern is not perhaps where the response comes but whether he gets a response.

A. Certainly.

340. As we all remember in the Gulf War, several industrial organisations did send specialists out to help. I would be interested to hear a little more of your views about this very knotty problem.

A. My Lord, as you might expect, I now see it from both sides. I genuinely believe that both parties have a legitimate role to play and can play a legitimate role.

341. "Both parties" being DRA and---?

A. Industry and DRA. Industry is, I think, rightly proud of the contributions it has made. I saw this from the MoD end at the time of the Falklands War. I might say at that time—particularly in the application of information where we were desperately seeking intelligence on equipment held by the Argentines—industry was able to say, "Yes, we supplied those Canberras. We know precisely what mark of aeroplane and engine and equipment was there." This was tremendously helpful and industry is proud of its ability to respond and is tremendously pro-British under those circumstances. I did audit what contributions some of the DRA establishments had made to the Gulf War and I recall there that there were genuinely identified engineering manufacturing type contributions which the MoD was unable to obtain from industry. I just saw a complementarity there. Certain quite humble bits of plastic were knocked out by the DRA at Chertsey, for example, for modifications to fighting vehicles. Chertsey had tried to get these things from outside but had simply had to set up manufacturing, literally within days, because there was no source. It is very difficult to put a pound value on that. All I am saying is that with the infrastructure—albeit very slender, because they were down to one welder, I think—there was the possibility to make a contribution that could not apparently be obtained from industry and it clearly was of value to the MoD. Whether one is then prepared to take the expenditure, to take the bill associated with maintaining that engineering infrastructure in DRA (perhaps under-utilised most of the time) against the day when there is a conflagration, is a judgment which has to be made by MoD, I believe. That judgment will be made, taking into account what response the MoD believes it can rely on from industry and whether the kinds of gaps that were filled by the DRA establishments were, in fact, essential or non-essential gaps. I cannot see the whole picture, but as it stands a contribution from both parties was helpful and would continue to be helpful in general terms. I do not know what premium one pays for that.

Lord Howie of Troon

342. Glancing through your written evidence, Mr Hughes, I get the impression that you are somewhat sceptical about DRA's new mode. You do not think it is up to much as a partner in LINK. You have just spoken about the loss of industrial capacity. You were never terribly impressed by its possibility in the field of wealth creation, you say here, and you are worried, of course, about various budgetary challenges which might lead to a loss of quality and breadth and a loss of critical skills. The one I want to ask you particularly about is Pathfinder. You say it is a good idea in its way and then you go on to say that the defence cuts would probably "blow it out of the water". Is this blowing it out of the very cold water that you are pouring over us already?

A. You want me to explain?

343. Yes, just the Pathfinder bit.

A. If I might just very quickly add a point about the cold bath thing. A lot of this is that DRA, I believe, still has to find a way of enunciating to itself and to the world outside, with great clarity, what its vision is. That vision has changed and until there is a clear vision, and until that is perceived by industry and the DRA—and until there is some track record of that vision being delivered—I think then that uncertainties will arise; and I was indicating the kinds of uncertainties that there are in people's minds. When I attended the first Pathfinder presentation there was a strong commitment on the part of John Chisholm to make a sum of money available year on year to fund Pathfinder programmes. Having been there myself, what immediately went through my mind was, "I wonder, actually, how he knows he is going to achieve that?" Partly he was committed, as I was, to increasing the efficiency of the DRA operation and that meant looking for more effective ways of doing things. That tended to be interpreted in terms of shifting the balance from internally resourced programmes to the use of more sub-contract work, particularly supporting major facilities, and so forth. So one presumes that something like half of the DRA budget becomes associated with contracts, administered by the DRA

[Lord Howie of Troon *contd.*]

and placed with industry. The other half is essentially locked into manpower and existing facilities which do not easily change year on year. Then you look at the second half and you say, "Typically, what is the life of a research contract, or a support service contract?" Some research contracts might be quite long, but certainly will be in the three to five-year range. Your ability to do new things next year, if your budget stays level, is determined by the number of contracts that run to completion. Therefore, if you stop spending money and the amount of money that that leaves—if one typically thinks of a five-year, constant cash-flow life to any contract, then in any one year, on a fixed budget, you will have 20 per cent headroom to do new things. If your average duration of research assets, contracts and support services is longer, you will have a lower free headroom percentage. You do not have to put in a run-down, cut programme, with a very high percentage per annum, to remove a large amount of that freedom. If you are on a level basis, your contracts do *that* [*indicating*] and *here* is your wedge of headroom and *that* is happiness. But if your budget does *that*, and your contracts are doing *that*, then you have no headroom at all. It was just at that point that I saw with the breakout of peace, the pressure on defence budgets, the pressure on DRA's budgets as a whole, the tendency to move more work outside—that the likelihood was that the DRA would find itself in the nutcrackers, without much headroom to do anything new, and I feared that Pathfinder would be one of the main programmes to suffer from that because it was all new. There was no on-going commitment. It all had to be a new programme.

Chairman

344. You have attended two of these conferences—or, rather, you attended the first and your colleague attended the second. Does that mean that you are a participator in Pathfinder and if so, are you a satisfied participator?

A. I am a participator. We have only put in a small number of proposals. They have been, I believe, reasonably well targeted and well focused and, at present, our success rate is around the 50 per cent mark, but that is one out of two last year. It is a bit like the experiment with three rats- one died, one escaped and one survived.

345. If you are going to achieve a 50 per cent success rate in future years you will be well happy.

A. We have four proposals in this year which we believe are well targeted. We are not using a shotgun approach. I am reasonably satisfied thus far. We have, however, seen funding delays on proposals and those are again small pieces of circumstantial evidence underlining the fact that perhaps the budgetary headroom is not as great as we might be led to believe.

346. Do you think that the delays are budget-induced?

A. In short, yes.

Lord Renwick

347. Mr Hughes, this morning we have heard your evidence, which has been added to your written evidence, and I cannot help but feel that from your privileged position as being part of the MoD before you were part of the DRA (and now you are in industry) that you have quite a clear understanding of the basic needs of the MoD and how they are being served by both the DRA and industry. I think our interest here is also in how the DRA is helping the basic research knowledge of the country. A lot of that must be affected by funding in one way or the other, and I believe your evidence has shown, first, that the underlying basic understanding of technology, which is so vital in the strategic advice given to Government for warfare, is being diminished by the current set-up; you also in your written evidence, as the second part of my question, say that the DRA is likely to suffer from short-termism, limited headroom as you have just described, in the Pathfinder project. Have you seen any clear evidence that this is already happening?

A. No. There is a lot of opinion and a lot of hearsay in this area and I am sorry, my Lord, I am unable to give you real specifics. The immediate data I had I already referred to, which related to programme slippages associated with Pathfinder, and I was seeing this as an indicator of the financial pressures. Coming to your first point, the sort of basic ability of the DRA to contribute to the nation's underlying knowledge must be diminishing, that must inevitably be true given the long-term history of reductions in manpower and the budgets and the perceived continuation of that. Efficiency measures and so forth will do something for you, but at the end of the day no matter how efficiently you operate, even if you are world-class, you cannot be expected to deliver ever more and more from less and less without limit. So there must be a pressure there. I believed very strongly when I was in the MoD's research organisation that it sat in a rather unique kind of role and position between academia and industry. The organisation maintained close links based on personalities—professors, graduates going to work for DRA and the rest—with universities, a close understanding and knowledge of what leading edge, blue sky research was being done in the universities, but the people in the DRA as it is now were living within the ambience of an understanding of defence needs and were therefore able to talent-spot those pieces of research which were likely to yield technologies of value for defence exploitation, so they acted as a bridge. That bridge brought knowledge and know-how into the DRA. The DRA by courtesy of the Deputy Chief Scientific Adviser's strategic research programme was able to build another bridge from the key technology, as yet without specific application, through to its demonstration of having potential for application in particular weapon system areas, and then the DRA was able, because of its funding for external contracts, to work with industry, to sub-contract industry to build proto-type hardware, and to test it, and to demonstrate to the end-customer the capability of novel technology to meet his perceived needs. That was a very complete, I might say, and a

[Lord Renwick *contd.*]

very nice seamless robe from the most leading edge of research through to demonstrated hardware. I believed that the DRA's great asset at the time was that the difference between DRA and the people who simply did paper studies on technology was that DRA had done it, DRA could actually show it knew how to do something because it had actually done it, it was not a theoretical answer—"Look, O customer, this is real." That is expensive, to cover the whole of that range is expensive and the first bit which tends to suffer is the demonstration, the building of prototype equipment, the flying thereof or putting it into submarines and the rest of it. No matter whether you do this within DRA's own facilities or whether you sub-contract that work to industry (and industry must be involved in all those processes otherwise they will not be able to build it for the end-user) no matter how you shift that balance, at the end of the day, if there is pressure on budgets those tend to be the expensive things. My fear is that we are not necessarily moving into an intellectual desert where there are not good connections with universities, where there is not good strategic research, I believe there is a good linkage at that end because that is the inexpensive end generally (although there are some major facilities required) but I am concerned that the future will not have enough hardware development and demonstration in concert with industry to reduce the risks associated with development programmes of real hardware for the Services.

Chairman

348. But is it not unrealistic to think you could maintain that degree of hardware facility? There are two pressures, not just the defence budget being reduced but also the nature of the threat is actually widening. It is perhaps harder to predict now where the next attack is going to come from or where the next war will be. So is it not more realistic to assume you will not cover everything and therefore you cut your cloth accordingly?

A. My Lord Chairman, I would agree with that. I do not believe that we can realistically cover every conceivable aspect of warfare and every conceivable technology within the United Kingdom defence R&D technology and development scene. I do believe that DRA ought to be involved in all the types of activities I described, but not necessarily for all conceivable types of hardware or types of mission. I do believe that one has to look at the prospects for international collaboration in this area, no matter how difficult they may be, and those prospects cannot pay off unless the international climate is such you can achieve a degree of inter-dependence, which means, "I will do excellent research from cradle to grave in some sector because I can afford to but I will rely on somebody else to do excellent research from cradle to grave in another sector." That seems to me to be the right way to cut the cake, rather than to say, "We will haul back on the depth of our understanding in all areas at once", which has tended I fear to be the pressure.

349. We are running out of time because the Committee wishes to have a period of deliberation. The clock has struck twelve. Unless any member of the Committee has a further point they wish to make I can conclude this session of evidence. Thank you, Mr Hughes, for the great help you have afforded us in our deliberations.

A. Thank you very much indeed, my Lord Chairman.

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HOUSE OF LORDS

SESSION 1993-94

MINUTES OF EVIDENCE
TAKEN BEFORE

THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

(SUB-COMMITTEE II DEFENCE RESEARCH AGENCY)

Thursday 24 February 1994

BRITISH AEROSPACE

Mr M Peters

ROLLS-ROYCE PLC

Mr S Miller and Mr P C Ruffles

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THURSDAY 24 FEBRUARY 1994

Present:

Craig of Radley, L.	Renwick, L.
Hilton of Eggardon, B.	Selborne, E. (Chairman)
Platt of Writtle, B.	Dundonald, E.
Redesdale, L.	

Memorandum by British Aerospace plc.[1]

SUMMARY

BAe recognises the national importance of the DRA as a repository of vital technologies, data and facilities. We acknowledge that industry has greatly benefited from a close association with the predecessors of the DRA and wish those benefits to continue based upon the DRA being a source of excellence in selected fields of research not easily established in industry. We understand that the principal influence on the work of the DRA should be the needs of the MoD.

In recent times we have understood the need for the DRA to seek to realign itself in ways analogous to the readjustments which have been necessary in the defence industry. We are in favour of measures which help the DRA to be more efficient and effective providing these allow the DRA to sustain excellence in the fields of work it is asked to cover. We have some concerns that the pressures on the DRA during this process will make for difficulties in demonstrating convincing impartiality between the interests of DRA as an enterprise and those of industry.

We favour an enlargement of the remit of the DRA. This should recognise the potential of the DRA to be more overtly supportive of industrial wealth creation in the application of the most appropriate technologies available. We would therefore support measures which were aimed at:

- Maximising the access of industry to the technology, databases and facilities of the DRA.
- Supporting industry in moves aimed at applying these assets to industrial products and services whether for military or civil markets.
- Adjusting the DRA research programme where, on the margins, industrial objectives (whether civil or military) can be accommodated usefully.

In parallel with these recommendations we would favour a review of the relationship of the DRA with MoD's research programmes. We believe that MoD should open its research requirements more fully and directly to industry and not do so only through the DRA. We say this for two reasons: so that we can compete across industry to supply the end customer (MoD) in as direct a manner as possible and secondly because we believe that there should be a predisposition on the part of MoD to have research work carried out in industry where it must ultimately be applied if wealth is to be created from it.

1. *The Defence Research Agency and its relationship with the MoD*

1.1 The DRA is not independent of MoD but the nature of this relationship is more a matter for the MoD and DRA than for Industry.

1.5 The main part of this question is a matter for MoD. The influence of the DRA's Trading Fund on industry is not yet well established and is viewed with some caution. The Trading Fund will apply incentives on performance and it remains to be seen whether these will be in the direction of carrying out within the DRA itself more or less of the work that could be done in Industry. Industry will welcome any moves to improve the efficiency of the DRA but also generally believes, as does BAe, that where research work can be done effectively in industry then that is preferable to it being done in a Government laboratory. The reasons for this are also addressed in later comments.

There will be obvious internal pressures to carry out the work within the DRA, especially if the alternative is to award contracts to industry on technical merit and then incur the cost of shedding good staff, who may well be a key resource for future years.

1.7 In times of crisis and conflict particularly, MoD obtains services from various sources. The DRA is only one of these sources. We believe that industry, including BAe, is also able to offer technical expertise and, additionally, the production capability to deliver any needed product in such situations. It will remain in the national interest that every source of assistance is used in such circumstances.

During more normal times, we believe that the DRA should provide such services to MoD and to other government departments as are a natural consequence of it's primary role as advisor to MoD. In addition, the DRA is the custodian of various significant national facilities and databases which should be readily available to industry for their business needs. However, we would not welcome the DRA extending either of these roles in circumstances which would permit it to become a state subsidised competitor to industry or which served to concentrate technologies within the DRA instead of in industry where they can be applied.

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[1] The paragraph numbers in this memorandum refer to the question numbers in the Committee's call for Evidence.

2. *The DRA's management, internal affairs and corporate strategy*

The issues raised in this section are largely a matter for the MoD but since BAe, along with others in industry, welcomes any measures which will improve the efficiency and effectiveness of the DRA, we have commented selectively.

2.1 We consider that it is essential that any restructuring of the DRA is carried out in such a way as to sustain excellence, even at a smaller scale. Restructuring, if driven by a need to reduce staff numbers and costs, must be done in a way which does not result in the loss of expertise in key specialised areas. Insofar as the DRA has a role in the wider industrial relationship we would invariably favour this being based on excellence rather than size or scope.

2.4 The "Pathfinder" process is aimed at allowing industry to inject their ideas into the DRA programme planning process at an earlier stage than was the case previously. It is not primarily a mechanism for industry to gain access to the results of the DRA research programme.

BAe is supportive of the "Pathfinder" concept but there are areas of concern and aspects that should be further developed. These are:—

(a) The MoD customer requirements are passed to industry in an "interpreted" form by the DRA. This hampers industry's understanding of the requirements and constraints of the MoD customer for the ultimate products. Direct access to the MoD customers by industrial providers should be a normal part of the process, rather than being discouraged.

(b) The emphasis is on a "one way flow" of information from industry to the DRA. A better interchange of ideas and concepts should be fostered.

(c) On a practical level, the timescales imposed on industry by the latest round of the "Pathfinder" process are unrealistically short and could prevent MoD receiving the best proposals from industry. BAe hope that as the Pathfinder process evolves a more appropriate sequence and timetable will be developed.

(d) The need for new ideas to be accommodated in a programme that is mostly already planned and committed has generated some feelings of frustration in industry. The total impact of Pathfinder proposals in the first round is understood to be only about 3 per cent of the DRA programme.

(e) There is a concern that the "Secondary Competition" rules mean that the DRA expert areas, to whom many of the proposals are referred, could then be in competition with industry for the work, possibly at a time when their positions and careers are uncertain. This is a manifestation of the "conflict of interest" inherent in the DRA's role as both judge and competitor for the MoD's research requirements.

3. *The DRA's relations with industry, Europe and the wider world*

3.1 We are of the opinion that not enough is being done to link the direction, content and results of the DRA's programme to Wealth Creation for the UK, either in the civil or military areas. BAe has been pleased to take part in discussions in this area and has provided encouragement to the DRA in this direction. We believe that this aspect should be given a high priority.

Comparison should be drawn with the clear tasking of the US agencies such as ARPA with supporting US industry. (See 3.11 later)

A fundamental issue is the application of technology rather than just its creation or transfer. The wealth creating application of technology is done in industry. The DRA is a major repository and generator of technology and it should be a matter of specific national strategic purpose for this technology to be accessed and applied in industry both civil and military to products for the world market. In our view there is also a need to consider whether the DRA should be such an important generator of technology in the longer term since this perpetuates the difficulties of then making it accessible to industry. It seems to us far more direct that technology should more usually be created in industry where it is likely to be used effectively in products.

3.2 Although the question refers to the transfer of technology we again emphasise the importance of its embodiment in products. There are many requirements which need to be met for this to take place successfully:—

(a) If UK Wealth Creation is to be maximised, through both the UK and export markets, then "time to market" is a major competitive factor. Transfer of developed technology to an industrial concern often results in significant delays. This competitive disadvantage can be avoided by carrying out much of the later stages of the research in industry, thus ensuring that they are fully familiar with the technology and thus are well placed to bring the resulting products to market in a timely fashion.

An additional benefit of this process is that the industry can concurrently contribute relevant manufacturing and marketing skills that are inappropriate to the DRA.

(b) Exploitation outside the defence industry requires a wide dissemination, to a wide cross section of industry, of both the existence and the potential of the DRA originated results. "Dual Use"—the application to different products of a foundation technology—is to be encouraged and BAe has been able to take some steps in this both internally with its wide range of products, and externally is working with other industries to develop mechanisms to encourage wider deployment and application. The DRA has an important national role to play in supporting this objective.

(c) Close involvement of leading industrial concerns is essential in the identification of viable market opportunities for the successful application of the technologies to Wealth Creation. We believe that this is a topic that the DRA can support but is not positioned to lead.

(d) The Intellectual Property conditions being applied by the DRA are in danger of delaying and limiting exploitation of results by industry. This is a complex subject but is central to the objectives of using the DRA's technologies to a broader national advantage. It is an area that requires specific attention in consultation with industry. This should address not only the IPR to be attached to new work but should deal also with the terms of access to existing technology rights belonging to MoD through the DRA.

3.3 The main linkage that we perceive is the position of the DRA Chief Executive as a member of the Technology Foresight Steering Group.

We would expect the DRA to be in a position to contribute their scientific expertise to the process but, under the DRA's present terms of reference, we would expect there to be no influence of the Technology Foresight outputs on the DRA programme, which is solely driven by MoD's needs. A broader view of the DRA's potential role would permit their contribution to a wider landscape of industrial benefit from the Foresight Study.

3.4 The current brief of both the DRA and indeed the MoD does not formally include concern for the strength of the industrial base. We perceive the interaction between the DRA and the DTI to be mainly one of the provider of services and a collaborator in joint research programmes such as LINK.

In terms of the level of DRA involvement in LINK itself, this has been limited, in our opinion, by the financial constraints placed on the DRA in recent years. Many of the LINK projects are civil oriented, and thus difficult to justify to the DRA's prime customer.

3.5 BAe does not regard the demise of Defence Technology Enterprises as having left a void to be filled, as we do not believe that they made any significant progress towards their original aims.

DRA should indeed be involved in fostering the wider exploitation of defence technology, but we strongly believe the motivation should be based on the maximum benefit to the UK through Wealth Creation and not on maximising the income to the DRA in order to balance local budgets. Strong preference should therefore be given to UK industrial exploitation. We are concerned that the current status of the DRA could lead to their need to maximise their income, perhaps by international sale or license of Intellectual Property, rather than maximising the benefit to the UK economy.

A further dichotomy exists in the role of the DRA as expert advisors to the MoD. In this role they may seek the exchange of technology with other countries, notably the USA. Such actions may benefit their role in supporting the MoD but may be disadvantageous to the UK economy when that technology is introduced to products which must then compete in the wider market.

3.6 Only industry can take the lead in the conversion and diversification process, as only they are in a position to make the necessary business judgements. The DRA should be fully supportive of industry's activities in this area, facilitating the access to appropriate technologies on fair and reasonable terms.

3.7 The reason for the existence of the DRA is to meet the needs of the MoD. These are, and should be, its main motivation for undertaking any research programme. However, any exploitation of the results for the purpose of Wealth Creation is strongly supported and should be undertaken as described in 3.1, 3.2 and elsewhere. Equally, the DRA should seek the cost savings from any synergy between the MoD's needs and those of civil industry by undertaking appropriate collaborative programmes. We believe that there is much potential advantage in adjusting the DRA's programme of research to recognise the wider needs of UK industry and that processes to this end should be developed and for the DRA to be permitted and required to do so within its remit from the MoD. BAe has already been in discussion with the DRA on these issues.

3.8 There is undoubtedly significant scope for actual or perceived conflicts of interest and a perception of unfair competition to arise as long as the DRA is tasked with being Supplier, Advisor and Arbiter of the MoD's research needs, and with undertaking secondary competition with industry in meeting those needs. The competition issue is not confined to packages of research work that are put out to industrial tender but concerns the fundamental remit of the DRA—is the DRA formally required to support industrial competence or is it focused on its narrower remit to MoD even if the latter should be in conflict with the interests of the successful industrial application of technology? The financial and managerial pressures on the DRA are evidently not in themselves conducive to fair and impartial judgement between in-house and industrial considerations. It will not be easy for the DRA to satisfy industry on this point whilst there is a perception that the DRA is at once an enterprise with its own survival instincts, a competitor, customer and independent advisor.

BAe would favour greater clarity on these issues.

BAe would much prefer a partnership, working closely with the DRA in a stable environment. Such collaboration offers many advantages, including avoidance of duplication, effective transfer to market, best value for money to MoD, etc. It would also enable the work to be carried out where it is most effective for rapid progress and exploitation. However, we recognise that such a relationship may not be compatible with a system that uses competition as the main criterion for establishing "value for money", rather than one which seeks to measure "cost effectiveness" by other means.

In the past, many such areas of collaboration existed. Over the last few years, various changes of the status of the DRA and its predecessors have confused these relationships, with some surviving intact and some having been damaged by the "open competition" philosophy of some two years ago. Stability is thus the first, essential requirement in the relationship with the DRA in order to rebuild these relationships.

The equivocal role of the DRA in various international fora also gives rise for concern. In many cases, the equivalent organisations from other countries have a much closer relationship with their industry and can negotiate on their behalf, rapidly and openly passing on information gathered. In the case of the UK, the DRA is viewed by others as being a representative of the UK as a whole, but for the reasons outlined above, UK industry is much less clear than it would wish that the DRA is committed to such a role.

We believe that the above problems have limited UK industry's ability to respond rapidly to European initiatives in the past.

3.9 DRA's involvement in the EUCLID programme is of a high level, with them acting on behalf of the MoD customer. This is a proper role, but again the dual role of the DRA should be recognised as a potential problem.

Involvement with other programmes is mainly in the role of a collaborator in joint projects, although there is also involvement with the DTI in the EUREKA programme as proposal assessors.

3.10 DRA appears to seek European collaboration in selected areas. Again, this collaboration should be driven by the technology acquisition needs of MoD and not by budgetary considerations.

European industry will rationalise over the next few years in response to market pressures. The relationship intended for the DRA with other European Institutions and between those Institutions and their national industries is not clear. (See also 3.8 above)

3.11 In certain other countries where no direct equivalent of the DRA exists, there is much closer linkage between the customer (MoD) and the supplier (industry). UK industry is not always involved in the early stages of new technology or concepts, to the detriment of both MoD and industry.

In particular, France has a very close relationship with its industry, even to the extent of supporting chosen "National Champions" in certain areas of activity. This leads to a more co-ordinated programme of research and a better transfer of technology to industry.

In the USA, we have seen added emphasis placed on ARPA's role as facilitator and procurer of research carried out by industry, with increased government funding, thus establishing new technologies where they will do most good to the national economy.

In both cases, this support extends to the procurement process.

Although these two examples are based on dramatically different political viewpoints, and may not be acceptable to HMG, they share the important common theme that industry is of vital importance to the economy and government agencies are clearly tasked with supporting this national asset. In contrast, the UK MoD, and the DRA, are not formally tasked with supporting UK industry.

January 1994

Memorandum by Rolls-Royce Aerospace Group

This paper is a response to some of the specific questions posed by the Select Committee.

The views are those of a major manufacturer and exporter of aero engines with a wide supplier base. Rolls-Royce engages in the whole spectrum of R&D activity, from basic research in physics and metallurgy, to the development of engines for specific market applications. We spend over £200 million pa of our own money on R&D, chiefly but not exclusively for civil products, while receiving some £90 million from the MoD for military developments. In addition in 1993, we received about £8 million from the MoD for military demonstrators and project studies, and another £5M for research, this being contracted with us by the DRA on behalf of both DTI and MoD. Our chief interface is with the DRA at Pyestock and our comments therefore necessarily relate mainly to this part of the organisation.

EXECUTIVE SUMMARY OF RESPONSES

The DRA is still very much the agent of the MoD. However, in addition to its role as the prime source of technical advice to MoD, it has nationally important expertise and facilities, which should be maintained alongside the defence industrial base. The DRA assets for research, which are under threat from "trading fund" considerations, should be complementary to those in industry but should not be subject to the same short-term commercial pressures. In some cases, they could be partially financed by directing them towards the exploitation of dual-use technologies on behalf of, and in collaboration with, industry.

Greater publicity in industry for MoD-funded research in the DRA is essential if these opportunities are to be exploited. The Pathfinder scheme and the "strategic alignment" of Roll-Royce's research with the DRA's which is already in place both provide mechanisms for identifying dual-use technologies. These arrangements must be extended if UK industry is to compete effectively with the US under the Clinton Administration.

Our interaction with the DRA in contracting for MoD research is generally satisfactory, and we do not feel ourselves to be competitively disadvantaged at present. Indeed, it is very desirable that practising scientists and engineers continue to be involved in the extramural contracting process. However, there has been a recent tendency to excessive bureaucracy in the administration of the contracts.

1. DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH THE MOD

1.1 *How independent of the MoD is the DRA?*

Since the Secretary of State for Defence is both the owner and the principal customer of the DRA (these functions being undertaken by separate branches of MoD), there is ultimately very little independence. As the owner, MoD has set the DRA's terms of trading and the DRA takes as its prime purpose the provision of technical advice to MoD. In addition, most of DRA's funding currently comes from MoD, the Research Package Managers performing the principal customer role. However, the DRA Council is run by the Defence Procurement side of MoD, rather than by the Defence Staff who are the customers for the research, and is not empowered to constrain the DRA by Civil Service rules.

1.2 *Is the DRA's new status as a trading fund a help or hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

In so far as this status demands that only "profitable" facilities and groups of expertise can be maintained in house, it will not always be possible to make a rapid, high quality response to ad-hoc requirements for research. In practice, a number of nationally important facilities are under threat of closure. If realised, this will be to the detriment of both the MoD and the industrial concerns who rely on the expertise and facilities from time to time.

1.3 *How does the DRA's status affect its research strategy?*

The requirement for funding by the Research Package Managers, who are accountable to the Services and in many cases have themselves undertaken recent operational duties, leads to a focus upon shorter term concerns.

1.4 *How has MoD's system of Research Package Management evolved in the light of the Ministry's own new Management strategy and the movement of the Agency towards trading fund status?*

There appears to be a trend towards more detailed surveillance of the contracting activities of their agents by the Research Package Managers. This may, in part, be responsible for the greater bureaucracy which is now apparent in our dealings with the DRA.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government Departments and private industry?*

Relations with MoD have been discussed in 1.1 above. The new terms of business do make specific provision for undertaking work for OGDs and other organisations. It has been said the DRA is a customer, supplier, partner and competitor for private industry. In practice, there has been a very strong strategic alignment between Rolls-Royce and the DRA, with joint review of our research in front of the Research

Package Managers and joint production of five-year plans. Other firms have probably not yet developed their relationship to the same extent, although the Pathfinder process is moving them in that direction.

1.6 *How is the process of formulating a strategy for the DRA being affected by the new thinking about Defence and foreign policy following the end of the Cold War?*

We are unable to comment on the process, but the outcome is clearly a much greater emphasis on the technology required to operate at close quarters to the "enemy" as part of a multinational force. There is thus considerable emphasis upon communications and integration technologies, at the expense of platforms and engines.

1.7 *How far should the DRA continue to provide non-research scientific and technical services to the MoD, as well as to OGDs and private customers?*

While the Secretary of State remains the owner of the DRA, it seems right that it should be possible for him to direct the Agency's resources to other activities, such as specific product development or modification, in times of national crisis. (However, in most cases, it is likely to remain more effective to rely upon the industrial base, provided that base has been maintained for the purpose.) It is also essential that the MoDs extramural research continues to be administered by the practising scientists of the DRA, so as to ensure proper integration with its own research.

2. The DRA's Management, Internal Affairs and Corporate Strategy

2.1 *Will planned re-structuring and rationalisation affect excellence or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?*

See the response to question 1.2

2.2 *Is the pace of rationalisation too fast or a logical and necessary consequence of the setting up of the Agency?*

This is difficult to judge from the outside.

2.3 *What are the implications of the new regime's freedom to set salary levels in order to recruit and retain specialist staff?*

We can offer no useful comment on this.

2.4 *Is the Pathfinder programme worthwhile? If so, does it need refining and how can it be improved?*

A recent Pathfinder Conference laid emphasis on the process of obtaining best value for MoD by tapping the "civil" developments of the industrial case. The benefits for industry in the absence of follow-on development contracts are less clear, but it is too early to make a proper assessment, since the first projects have not yet begun. Moreover, the principle seems good and the (very small) percentage of work contracted in this way might usefully be increased.

2.5 *How does the DRA identify future defence needs and is its method of identifying such needs properly thought out?*

We are unable to comment on this issue.

3. The DRA's Relations with Industry, Europe and the wider world

3.1 *Is enough being done to link the defence orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?*

Such spin-offs should be a major concern and the White Paper on Science, Engineering and Technology does suggest this, but not enough is being done. Compared with the clearly expressed policy in the USA, there appears to be insufficient recognition in the MoD of the need to support the defence industrial base through this mechanism. The emphasis of the DRA's Pathfinder programme is very much upon obtaining better value for MoD by trading on industrial research which has been carried out for civil purposes ("spin-in"), rather than on developing dual-use technology with the possibility of spin-off. The balance is already in the MoD's favour, particularly in process and materials technologies, because civil programmes provide the background information for any military submission.

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

The first essential is to ensure publicity for the technology. Even where national security is involved, presentations on DRA activities could be made to security-cleared personnel from industry. Industry could then place contracts with DRA for collaborative exploitation in the civil sector.

3.3 *How does the DRA connect to the Technology Foresight exercise being conducted by the OST?*

Once the key industrial technology sectors have been selected in the Foresight programme, it is essential that DRA are involved in identifying where there is technology push or the possibility of spin-off from military developments. This is in addition to their obvious role if "defence" is chosen as one of the sectors.

3.4 *How effective are the DRA's links with the DTI, and is there too little DRA involvement in the DTI's LINK scheme?*

The DRA are effective administrators of the DTI's research funding for aero-engines. The response to requests to the MoD from the DTI for information on existing DRA research programmes, in order to establish work of relevance to civil aviation requirements, has so far been tardy, but this is not in the hands of the DRA. If the SERC's Innovative Manufacturing Initiative is supported, there will be a proper framework within which the MoD can co-fund work in universities, and this will presumably run in parallel with the LINK scheme and involve the DRA.

3.5 *Has the DRA effectively filled the void left by the demise of Defence Technology Enterprises and is the DRA any more likely to succeed where DTE failed?*

We have no view on this issue.

3.6 *What is to be the DRA's role in the issues of conversion and diversification in the defence industry as a whole?*

As discussed in 3.3, the DRA should be involved in Technology Foresight and should be identifying conversion opportunities there, in response to issues identified by industry.

3.7 *How should the DRA relate to the part of industry which is not concerned with defence and how should it focus on dual-use research?*

Participation in working groups, such as that established by the DTI to look at the Aviation Committee's National Strategic Technology Acquisition Plan, should enable the DRA to identify potential dual-use research across the aviation industry as a whole. For engine research, the display (at annual reviews) of Rolls-Royce's privately funded programme for civil and generic applications, alongside the DRA funded work, enables easy identification of dual use. Similar dissemination of DRA research on other topics would be beneficial. The Pathfinder scheme could have enlarged terms of reference to enable dual-use criteria to be applied in project selection. It remains to be seen how effective the proposed Dual Use Technology Centres will be: much depends on industrial support.

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

The appointment by DRA of a Review Board with predominantly external membership and of an ombudsman, should provide an adequate mechanism for ensuring fair practice within the existing rules. On the one hand, DRA appears to be hampered in its bidding by the requirement to pay back the loan of their capital facilities, but on the other hand, its provisions for redundancy and rationalisation as part of the competitive bidding process merit closer examination.

3.9 *What kind of relationship exists with the EC Framework Programme and other European programmes such as EUCLID and EUREKA?*

DRA participates in these programmes in the same manner as industrial partners, and appears to use the same criteria in selection including whether there is good value for money from the gearing which is obtained, and whether UK crown jewel technology is protected. Its ability to offer independent advice to the EEC on industrial participation depends on the extent to which strategic alignment with industry has been achieved.

3.10 *Does the DRA see European collaboration as a matter of course?*

Probably not, but as far as Aerospace is concerned, it has had to recognise that the future will lie in some formal collaboration between all the European Aerospace Research Establishments, particularly as individual nations become less able to support the full range of facilities. We support the intentions expressed by the six European Establishments in their action plan to form an "Association". This should lead to the more efficient use of facilities and to the recognition of Centres of Excellence in particular Establishments, thus avoiding duplication.

3.11 *Is there in other countries anything relating to the management of defence research from which the UK could learn?*

In the USA under the Clinton Administration, there is a clear determination to contribute to the preservation of the defence industrial base through the placing of wide-ranging government research contracts.

January 1994

Examination of witness

Mr M Peters, Director of Technical Planning, British Aerospace plc; and Mr S Miller, Director of Engineering and Technology, Rolls-Royce plc, and Mr P C Ruffles, Director of Engineering, Rolls-Royce Aerospace Group, called in and examined.

Chairman

350. Thank you for joining us. Would you like to introduce yourselves first of all so that we know who you are?

(*Mr Miller*) My Lord Chairman, my name is Stewart Miller and I am engineering and technology director for Rolls-Royce. Mr Martin Peters of British Aerospace is representing Mr Trevor Truman, and I think that Mr Peters would like to offer to the Committee Mr Truman's apologies.

(*Mr Peters*) If I may, my Lord Chairman, Mr Truman very much regrets that he is unable to be here today but urgent business has taken him overseas and he asked me to present his apologies and thank you for letting me stand in his place.

351. Thank you, he has very kindly and courteously written to me and I am most grateful to him for having done so and I quite understand.

(*Mr Miller*) My Lord Chairman, Mr Philip Ruffles is engineering director of the Aerospace Group of Rolls-Royce and therefore our principal interface with the Defence Research Agency.

352. Thank you very much. I think you will have had sight of some of the questions that we might ask although I do not promise that we will necessarily ask all of them or, indeed, that we will stick to the list, but it might give you a flavour of some of the questions that we might wish to address. If there are other issues at the end that you feel you would have liked to have addressed, please let us know. You must decide who you would wish to answer the questions—it may be that all of you would wish to answer a question or one of you, and I will leave that entirely to you.

(*Mr Miller*) Thank you, my Lord Chairman, if we can do that it would be from our point of view a very acceptable way of proceeding. It may be that you will get two answers or one answer to any particular question.

353. We thrive on variety!

(*Mr Miller*) My Lord Chairman, one of the aspects that may appear as we answer the questions is the slightly different starting point between British Aerospace and Rolls-Royce in terms of the relationships with the Defence Research Agency for the very simple reason of the breadth of the interface between the company and the agency. I am sure that you will all realise that the interface with British Aerospace is over a very broad segment of the defence sector. On the other hand the Rolls-Royce interface is quite a narrow one entirely on aircraft engines and some characteristics are therefore different between our two companies. That I think we will enlarge during our discussion.

354. I wonder whether it would be helpful just by way of introduction if you elaborated a little further on the written evidence that you have given about this relationship with the Defence Research Agency as to how it actually operates and how you see it developing.

(*Mr Miller*) Perhaps I may start, my Lord Chairman, and then ask Mr Peters to continue. The relationship between Rolls-Royce and the Defence Research Agency is, as I say, a fairly well defined segment of activity, a long established relationship with what started as power jets at Pyestock near Farnborough and moved through the National Gas Turbine Establishment and is now of course part of the whole agency. The intimacy of that relationship has continued through these years. It has led I think to a considerable degree of co-ordination between the work at Pyestock and the work within the company. We believe that that has been a very fruitful relationship for many years. There is co-ordination in terms of future planning for programmes and there is complete visibility in each direction of the work that is done. It is a well established harmonious relationship. That is a very broad initial description. Perhaps Mr Peters would like to come in there.

(*Mr Peters*) My Lord Chairman, we have a good relationship with the Defence Research Agency. It is primarily defence-related, of course. There are also some civil technologies on which we deal with the Defence Research Agency. There is a very wide spectrum of activities, as Mr Miller has already mentioned. What characterises the British Aerospace relationship with the Defence Research Agency I think is that we have less of a togetherness relationship, if I may put it that way, than the Rolls-Royce experience. In fact, we have as one of our objectives a move towards the sort of relationship that Rolls-Royce have enjoyed over a number of years and we are taking active steps with the Defence Research Agency to try to achieve that objective.

[Chairman *contd.*]

355. What would be your objective in precise terms that you would like to achieve that you have not achieved at the moment?

(*Mr Peters*) I think that we should like to have much more openness between us as to the content of our particular programmes, my Lord Chairman, more joint programmes, to build much more of a partnership relationship than exists at the present time.

356. Do you feel that at present you are not making as large a contribution as you might be able to do were you asked in planning the research programmes?

(*Mr Peters*) My Lord Chairman, I think that it affects both sides. I think that there would be benefits all round if we could agree perhaps in more detail than we do at the present time precisely who should do which particular piece of research, how we should exchange information on that research and involve each other in each other's research. I think that we could move more in that direction with benefits all round.

357. If I may turn now to the Defence Research Agency establishments, would you like to give us your view as to whether in the process of transition the quality or the nature of the services has in any way changed as provided by the Defence Research Agency?

(*Mr Miller*) My Lord Chairman, this might immediately be an illustration where there would be two answers which reflect the comments that we have already made. I do not believe from the Rolls-Royce point of view that we have seen very much change over the period of transition. That is because of the longstanding nature of the association and in fact a continuity of personnel on both sides which is an important part of any relationship. We could make a general observation perhaps, looking forward. In the development of research packages, which is part of the process that has been introduced, if these packages are coming from the operational side of the Ministry of Defence as the ultimate customer of the Defence Research Agency, then there may be some lessening of priority on longer term issues and that might become a question for us. But the transition over the recent past has been very slight indeed and we aim to continue the harmonious relationship that we do have now.

358. Do you detect a movement towards short termism?

(*Mr Miller*) I should not say that we detect one, my Lord Chairman. We expect that there might be some pressure towards that, but given the co-ordinated planning of our total research programme between the Defence Research Agency and the company we shall obviously endeavour to maintain the right balance. There might well be, as I say, an extra operational pressure and, of course, in the aeroengine business as in fact in most high technology industries, there is a requirement to look very far into the future in technology terms as also to look at the near term.

359. Mr Peters?

(*Mr Peters*) Thank you, my Lord Chairman. From the British Aerospace point of view I think that we have detected a much more commercial approach since the creation of the Defence Research Agency. That we regret in some ways because it does rather inhibit the building of the partnership relationship that we have as one of our objectives to achieve. On the other hand I think that we can understand the pressures that have led them to adopt a more commercial approach. I think that we are concerned though that this commercial approach might have implications for the long-term availability of major test facilities. Wind tunnels in particular are a cause of some concern. We are worried that perhaps short-term commercial pressures might lead to the closure of some of these facilities and we believe that this would be a considerable loss to the nation as a whole.

360. Do you see short termism coming into it?

(*Mr Peters*) The short answer, my Lord Chairman, is yes, I think that we do see an emphasis more on short term although that is not to say that there is no long-term activity—there quite clearly is. I think that we should accept—this is the point that Mr Miller was making—that there is a feeling that people are focused more on the short term these days.

361. Do you feel that there are strategic implications here that some of the long-term work that has been cherished and that has been valued by the Ministry of Defence in the past and perhaps has had important benefits also for industry has not been given sufficient weighting?

(*Mr Peters*) I think that it would not be fair to draw that conclusion. I think that quite clearly the Defence Research Agency find themselves under some budgetary pressures primarily because their main customer, the Ministry of Defence, is under budgetary pressures. In such a situation there will always be very difficult decisions to be made as to which research should be funded and which should not. I think that one of the results of the change in the arrangements for the management of research within the Defence Research Agency was to introduce customers within the Ministry of Defence who are in the operational requirements area primarily. Those people tend not to stay there for very long and I think that inevitably that leads to a certain short termism in their thinking: they like to make their mark while they are there. That having been said, of course, there are of course equally civil servants, people within the Ministry of Defence, who are there for considerably longer periods of time and I think that one such area is the strategic research area. People are in post for quite some time and there is still a considerable amount of thought that goes into the requirements for long-term research. I believe that it is the lack of money that is actually creating some of the pressure and some of the worry.

Lord Renwick

362. My Lord Chairman, what Mr Peters has been saying surely raises a rather fundamental question as to the value to the Ministry of Defence of the combined efforts of the Defence Research Agency and both companies in fact in that you are noticing a more commercial approach, I think you said, by the Defence Research Agency. Does this make your combined efforts with the Defence Research Agency

[Lord Renwick *contd.*]

more effective or less effective than the service that you are giving to the Ministry of Defence in giving them the best that new technology can offer in the field of defence, understanding that the more commercial approach must worry you as commercial companies with shareholders in the sense that you cannot get what perhaps you used to when they were not commercially inclined?

(*Mr Miller*) My Lord Chairman, perhaps Mr Ruffles might illustrate by way of answer on the aeroengine side.

(*Mr Ruffles*) My Lord Chairman, may I perhaps try to explain firstly where the nervousness comes from and what the situation is at the present time. We have to recognise that research by its nature takes a long time, several years, and the Defence Research Agency has been in existence for about two years and in an operating sense for less time than that. A lot of the nervousness is in fact about what we fear might happen rather than what has actually happened to date. I do share Mr Peters' concern that the customer is now the operational requirements part of the Ministry of Defence and personnel do change rapidly so that as they change there will be an inclination when new people come in to want to change the research strategy which could lead to a certain amount of short termism. It is not an uncommon problem inside industry and we tend to take the view that we will protect by different funding routes part of the research so that that short-termism does not occur. However, with the DRA a large amount of the funding, at this point in time, comes directly from the Ministry of Defence through its managers. It is therefore a concern as opposed to actual fact that the longer term work will go

(*Mr Peters*) My Lord Chairman, perhaps I might add to that. On the question of whether the Ministry of Defence benefits from a less commercial relationship between the Defence Research Agency and the industry, certainly in my view it would and I think that quite clearly it is a swings and roundabouts situation. My belief is that there is more benefit for the Ministry of Defence through a partnership between industry and the Defence Research Agency than having this commercial, somewhat more confrontational, arrangement. However, I think that not only would the Ministry of Defence benefit from that closer partnership between the Defence Research Agency and industry but many other non-defence-related activities carried out by the companies would also benefit, so I believe that the sort of relationship that I have been advocating would have broad benefits for the United Kingdom economy and would not just be confined to benefits to the Ministry of Defence.

Chairman

363. Are there some areas that you feel inhibited in talking about to the Defence Research Agency whereas in the past when they were in a less commercial role you might have been less inhibited?

(*Mr Peters*) Yes, my Lord Chairman, I can actually think of a few occasions when we have in fact been reluctant to talk to them because we see ourselves as being in competition.

364. So this clearly does not help the Defence Research Agency to do their job in advising the Ministry of Defence if they are not able to talk to you openly about aspects on which you can help?

(*Mr Peters*) I think that that is fair comment, my Lord Chairman.

365. I do not know whether Mr Miller would like to comment on that?

(*Mr Miller*) My Lord Chairman, I think that the Rolls-Royce situation as I said right at the outset is perhaps different in that there is a longer established relationship of co-operation. I am not aware of any particular inhibitions between the agency and the company which have developed recently. The relationship continued following its previous characteristics. There is a difference, but it may well be because of the nature of the products as well as the history of the relationships.

366. From Mr Peters' point of view I appreciate that it must be of some concern that the Defence Research Agency is developing interests in an area that might be seen in one sense to be in competition with some of your research programmes and that that would inhibit you from being able to discuss openly future research programmes in this area or share information which might have a market value. I think that that was the point that you were making, Mr Peters?

(*Mr Peters*) Yes, my Lord Chairman, I should not want to make too much of it. It is not a very great problem, but it does exist.

Lord Craig of Radley

367. Would it be fair to say in the case of Rolls-Royce that it would be difficult for the Defence Research Agency to look to others for competition *vis-à-vis* yourselves and to that extent, as I think that you said at the beginning, you are rather distinct from British Aerospace, which covers a much wider spectrum?

(*Mr Miller*) Yes, that is absolutely right, my Lord Chairman.

Chairman

368. I was going to move on now to the demonstrator programmes and ask you whether you felt that they had fulfilled a valid role and whether you saw the creation of the Defence Research Agency having any effect on the Government's willingness to continue to support such programmes?

(*Mr Miller*) My Lord Chairman, I think that the question with which we were furnished regarding demonstrator programmes did illustrate the gas turbine part of it. Of course, the principle would apply to most of the products that are involved with the aerospace industry and its customer, the Ministry of Defence, but it is a well established principle and very successful. As far as aeroengines are concerned the application of it goes back I suppose in this country about 20 years, and stems from serious difficulties that did occur in a number of aeroengine development programmes where the technology base was not sufficiently firm at the point at which the development programme leading to production was launched. The difficulties were not confined to

[Chairman *contd.*]

military programmes; they existed in civil engine programmes as well. The particular value of a demonstrator programme is that it takes earlier research on one particular component of an engine (or a number of different components) which has been carried out in isolation and puts together the total package to investigate the interfaces, the technical interactions, between components which, if they are not tackled and solved early can lead to difficulties in the full flood of a development programme. One of the engine programmes that suffered from that lack of demonstration was the RB 199 for Tornado and our colleagues in the Ministry and the company were quite determined that that would not happen with the next generation. In fact the programmes that were conducted on engine demonstrators, jointly funded, led to what has so far been a very successful EJ200 development programme for the European fighter. The technical principle is well established and one that we apply in slightly different ways depending on the style of engine that ultimately is going to be developed. In the engine field it is a principle that I think is totally supported by the Defence Research Agency, but of course the funding comes from another source within the Ministry and the demonstrator programmes have therefore continued. In fact, within the recent timescale of the Defence Research Agency being in existence we have had significant increases to demonstrator contracts looking forward to demonstrating this integrated technology over the next five years or so, so it is a principle and a practice that continues and it is one that we believe in implicitly.

Baroness Hilton of Eggardon

369. My Lord Chairman, if I may, I should like to go back to the relationship between the Defence Research Agency, industry and the Ministry of Defence, a tripartite relationship. In their written evidence British Aerospace expressed concern that things had to be channelled through the Defence Research Agency rather too much, but we have heard from other witnesses and from the Ministry of Defence that they do relate to industry and there might be a concern in that way that the Defence Research Agency was bypassed and that in some ways the strategic thrust of what was happening might become dissipated. Would you care to comment on that? Are you concerned that too much has to go through the Defence Research Agency?

(*Mr Peters*) My Lord Chairman, it certainly is a worry as far as British Aerospace is concerned, I think primarily from the point of view that if you are trying to conduct a dialogue with someone through an intermediary it is always more difficult than if you have it directly face to face. When you are talking about longer term research requirements—and I think that that is primarily the area that is of concerned to us—I think too that it is very much a question of the facilities, the capabilities, that industry thinks it could bring to bear on a particular problem that will influence the content of the programme, the timescale of the programme. That information is not always very well known to the Defence Research Agency. I think that we do see that it would be a lot better if we could have the direct dialogue with the Ministry of Defence customer to help him establish his requirements really and to help him clarify what his needs are very much in the light of knowledge of what the industry can offer.

370. But then there is the danger or problem that people within the Ministry of Defence may not have the necessary scientific or technological expertise in fact to judge what you are offering and that they should at least be able to use the Defence Research Agency as a source of advice and comment on what you are proposing?

(*Mr Peters*) Yes, my Lord Chairman, I do not think that I should dissent from that. I am not trying to say that the Defence Research Agency should be excluded from the process—indeed, I see very great benefits in their being included in the process—but I think that we should like the opportunity to talk more directly to the Ministry of Defence customer when he is in the process of trying to formulate his future research requirements.

371. It is slightly puzzling because other evidence that we have had suggests that industry has no difficulty in accessing the Ministry of Defence directly, and the Ministry of Defence in fact said that to us.

(*Mr Peters*) We have different perceptions.

(*Mr Miller*) My Lord Chairman, it might be worthwhile hearing from Mr Ruffles here.

(*Mr Ruffles*) I think again, my Lord Chairman, it is perhaps reflecting a different history and practice and the more much focused activity of Rolls-Royce. Perhaps I may just describe the way that we operate with the Defence Research Agency and the Ministry of Defence and, for that matter, the Department of Trade and Industry on research, which might explain why we do not have those problems. We have regular review meetings which take place over particular subject areas with all four parties involved, that is, the operational group of the Ministry of Defence, the Department of Trade and Industry, Rolls-Royce and the Defence Research Agency. Those meetings will look at what has been achieved on the research programmes irrespective of where it has been funded. The work could have been carried out by the Defence Research Agency or funded through the Defence Research Agency by either the Ministry of Defence or the Department of Trade and Industry onto Rolls-Royce or funded by Rolls-Royce itself. Those reviews will also include some of the output of our demonstrator programmes and even some of our product development programmes so that there is quite an open relationship. That serves to enable that the Ministry of Defence, or the Department of Trade and Industry for that matter, actually understand what the total research strategy is for aeroengines and as a consequence they find it easier to be able to fit their requirements into a total strategy. That is why I think we do not see the same difficulties as maybe Mr Peters has illustrated, and we should certainly not want to see the relationship change.

(*Mr Miller*) My Lord Chairman, I think that again that probably reflects the point that Lord Craig made, that it is quite easy to put together the total United Kingdom effort on aeroengines. The only other people who work on aeroengines are making

[Baroness Hilton of Eggardon *contd.*]

tiny little machines which are not really relevant to the discussion today.

Lord Craig of Radley

372. But would you agree that it is important to Rolls-Royce that there is a Defence Research Agency, certainly as far as the customer is concerned, that there should be both a Defence Research Agency and a Rolls-Royce working in this area rather than just the Ministry of Defence—to take an extreme example now—saying to you, Rolls-Royce, "Please produce engines to whatever specification" and leave it at that?

(*Mr Miller*) Yes, my Lord Chairman, we should certainly agree with that, both from the point of view of two teams of technical people, where as in anything two heads are better than one; and, of course, the question that Mr Peters has hinted at, the value of the facilities that are available to the Defence Research Agency, and perhaps you will want to carry on and discuss that at some point this morning, my Lord Chairman. There are unique national facilities which a company would not want, in fact, could not afford, to replace or to duplicate, so there is a place for what Mr Ruffles has described as a four-way relationship which we are pretty satisfied with.

Chairman] I wonder whether this would perhaps be a good moment to pursue that point about facilities which are held within the Defence Research Agency.

Lord Craig of Radley] Indeed, my Lord Chairman, I was in fact seeding the ground for a later question.

Chairman

373. I think that it would be helpful to know whether you could identify what such facilities might be that you would see as being particularly important.

(*Mr Miller*) My Lord Chairman, if you agree, perhaps Mr Peters and Mr Ruffles could go through the details on that.

(*Mr Ruffles*) I think that there are five areas that immediately come to mind on aeroengines, my Lord Chairman. The first is a noise facility which exists at the Defence Research Agency for jet noise which is unique in Europe. It ideally now needs some upgrading. It is primarily used for civil, not military, applications, and I think that that is one of the reasons why its future is always in some doubt. That is of great concern to us because if that facility were to disappear then there is no facility that we could get ready access to in Europe. The second facility is no longer part of the Defence Research Agency, in fact, but was part of the National Gas Turbine Establishment and the Royal Aircraft Establishment at Farnborough and that is the altitude test facility. That facility is on the same land as the Defence Research Agency at Farnborough but not any longer managed by them; it is managed directly by the Ministry of Defence. It really has two roles, my Lord Chairman. The first is the high altitude testing of military engines such as the EJ200 where there are indeed other facilities in Europe that can do that, including Stuttgart in Germany. It is the only facility in Europe that can test large civil engines of the size of the RB211 and the smaller Trent engine. That facility has been under threat for some time and were that to be closed, which is one possibility, I think that two things would happen. The first is that all military testing would probably migrate towards Europe and all civil testing would be forced to go to the United States as the only place where we could get our civil testing carried out. Indeed, we are already having to do that in the case of the largest Trent engine because that facility has not been upgraded to match our requirements. Those are two very specific, dual purposes facilities. There are then three other areas. They are, the compressor facility which was closed (and I think that they are now in the process of trying to reopen it again), the combustion facilities which they have which complement ours and a turbine facility which was closed which again to some extent complemented our work. The point that really comes out, I think, my Lord Chairman, is the importance of actually having firstly a national strategy for these major facilities and possibly a European strategy because without one then what I fear is that all the facilities will appear in other parts of Europe and then that will mean that a lot of the technology eventually will appear in those parts of Europe and not in the United Kingdom.

374. But you are a multinational company in many senses. Do you mind where you do some of this technology?

(*Mr Ruffles*) My Lord Chairman, I think that there are two points. If you want a competent research team then I think that they have to have access to certain facilities and I think there is a concern that that access has reduced, so I think that that is one point. The second as far as these two particular unique ones are concerned, the noise facility and the altitude test facility, we are quite concerned from a Rolls-Royce point of view that these facilities will disappear and leave us in a very much disadvantaged position.

375. If either one of those facilities was threatened with closure would you contemplate buying them?

(*Mr Ruffles*) The cost of operation is extremely high, my Lord Chairman, particularly of the altitude facility. It depends largely on the throughout of work on both military programmes and civil programmes. We have looked at these schemes before and can never see a way of affording them.

Baroness Platt of Writtle

376. When you were saying that they are very expensive to operate, are there other people who use them apart from Rolls-Royce?

(*Mr Ruffles*) As far as the altitude facility is concerned, my Lord Chairman, we are the dominant user. Westland I believe have historically used it for helicopters as well. As far as the noise facility is concerned I think that we are pretty well the unique user.

(*Mr Miller*) My Lord Chairman, on the question of future purchase of the facility and operation by the company, I think that that would become another illustration of a disadvantage that we should suffer relative to our main American competitors; I am

[Baroness Platt of Writtle *contd.*]

thinking particularly of the civil field where there are corresponding facilities in the United States which are owned by the United States Government and have a very significant capability, and we are certainly not aware of any plans by the United States Government for them to be divested and taken into private industry. That therefore would be another illustration of the inequality which we continually see *vis-à-vis* Pratt & Whitney and General Electric.

Lord Craig of Radley

377. Since the Defence Research Agency became a trading fund have there been any changes in the arrangements from your point of view for the use of these facilities?

(*Mr Ruffles*) My Lord Chairman, not those that are today in the Defence Research Agency. The altitude test facility is not today in the Defence Research Agency, it is in the test and evaluation part of the Ministry of Defence and there is continual dialogue as to the commercial arrangements in respect of that facility.

(*Mr Peters*) Perhaps I may add just a word here, my Lord Chairman, for wind tunnels on top of the engine test facilities. The Defence Research Agency owns a number of quite unique wind tunnels, unique in so far as the United Kingdom is concerned and unique in some cases as far as Europe is concerned. We make sporadic use of these facilities, and I think that that is a reflection of the way in which computational methods are overtaking wind tunnel test methods. That is not to say that we should do away with the need for wind tunnels, but there is less use being made of wind tunnels these days and they are used more for confirmatory testing of the results of the computations. They are nevertheless still essential to the whole process of designing commercially viable and defence capable aircraft and we certainly see the continued availability of the Defence Research Agency wind tunnels as being very important to our future competitivity.

Chairman

378. I can see from what you have both said that wind tunnels and the noise facilities are important to your businesses. Are they critical to the Ministry of Defence, given their requirements?

(*Mr Ruffles*) My Lord Chairman, not the noise facility, no.

(*Mr Miller*) But the altitude test facility covers both large civil engines and advanced military engines such as the engine of the Euro fighter, and therefore it is important to the Ministry of Defence as the ultimate customer. I think that it is fair to say, my Lord Chairman, that a larger proportion of a military engine development programme has to be conducted at simulated altitude conditions than in the case of a civil engine because of the wider operational envelope in terms of speed and altitude. So the proving out of the military engine under all sorts of altitude operating conditions is very important, and doing as much of that as can be done before the aircraft actually takes the air is a high priority.

Lord Craig of Radley

379. I should certainly think that in peace time there will be continuing pressure even on military engines for quieter running, so it could be that that facility is also important in the long-term future?

(*Mr Ruffles*) The noise facility, yes, my Lord Chairman.

Lord Redesdale

380. My Lord Chairman, this touches on some of the questions that have been asked earlier. You were talking about research and development investment and the fact that the new tendering regime might affect how much companies are willing to invest in research and development. Do you see that the amount of investment in research and development will fall or is it a growing proportion of your defence turnover, and is this similar to the reinvestment by foreign companies?

(*Mr Ruffles*) If I may talk for Rolls-Royce, my Lord Chairman, some numbers might be useful here. The American industry enjoys about £500 million per annum in government investment in its aeroengine activities, and that is split between the various engine manufacturers in the United States. We enjoy about £25 million of government investment in research and development of one form or another—I am sorry, that is, the aeroengine industry, in the United Kingdom including the DRA enjoys about £25 million. Our company investment at today's date on military programmes is about 4 per cent of our turnover. That is against a background where our turnover has roughly halved in the past ten years and our investment in real terms has at least doubled so we have seen about a four-fold swing in ten years in the amount of funding that we are putting into our military programmes. I think the direction that we see is still going in the adverse direction for Rolls-Royce where we are still being asked to put more money in research with less from the Ministry of Defence, and that is a worry. That is not today true of demonstrator programmes where we have seen a significant increase in demonstrator programmes in the last 12 months, but the general direction on research investment as a percentage of turnover is very much in the direction of the company putting a lot more money in.

(*Mr Peters*) My Lord Chairman, as far as British Aerospace is concerned, our company investment in research and development activities is in the order of 2 per cent of our sales. The actual total amount of research and development investment which includes external contract funding for our research and development is somewhere between 13 per cent and 14 per cent of sales, so it is a fairly significant amount of money which we are talking about. Limitations on the amount of company investment of course are profitability and, as I think everybody here will be aware, making a profit out of the aircraft business has been increasingly difficult in recent years and has led to cutbacks in some areas in the amount of investment in research and technology.

Lord Renwick

381. May I then, my Lord Chairman, move on to the question of research and the transfer of technology from defence to civil. I think that there has been, shall we say, a falling off of practice between your two companies in perhaps the successful transfer of such technology. What I was wondering, to take Mr Peters' company's evidence, was this: they said they wondered whether the Defence Research Agency should be such an important generator of technology in the longer term since this perpetuates the difficulties of then making it available to industry. I wonder whether you would perhaps like to comment on that and then possibly Rolls-Royce would like to comment on their practice over the last five years?

(*Mr Miller*) My Lord Chairman, perhaps Mr Peters would like to start and I will follow.

(*Mr Peters*) Thank you, my Lord Chairman. The position that British Aerospace adopts, I think, is, as we said in our written evidence, that technology is of no use to anybody unless it is applied in due course to products, which means that there has to be a transfer of technology from where it is generated into the area where it is actually going to be used. We believe that the earlier that transfer can take place, or at least the involvement of industry can be arranged, the better, so we very much advocate early involvement of industry in the Defence Research Agency's strategic research programmes very much along the lines of the partnership which, I am afraid, I keep mentioning because I think that it is essential to the way that we see things evolving in future. If we can have this joint arrangement, then the transfer of technology is eased very much, and I think not only is it eased but the industry experience can be brought to bear on the Defence Research Agency research programme, I think to the benefit of both parties. In essence, therefore, what we should like to see is a greater involvement of industry at an earlier stage of the process, very much building on a partnership between the Defence Research Agency and industry.

382. And would this partnership be possibly two-way, as partnerships always are, so that you would be quite happy for the Defence Research Agency to benefit commercially from your exploitation of their original technology?

(*Mr Peters*) I think that that is absolutely right, my Lord Chairman.

383. And in this way you would ensure that they would continue to retain that technological capacity to enable them to remain an expert adviser?

(*Mr Peters*) Absolutely, yes, my Lord Chairman.

384. Perhaps we could go on then and ask Mr Miller also in respect of dual use technology.

(*Mr Miller*) My Lord Chairman, I think that there is here an illustration of the differences that reflects the products that we are manufacturing. You heard earlier from Mr Ruffles that there was indeed a four-way partnership that does involve the Department of Trade and Industry and the company with its total experience of both civil and military in planning future research programmes, so I should therefore take issue with Lord Renwick suggesting that there has been a falling off. In fact, my Lord Chairman, there has probably been an increase in the transfer from the civil base of research technology acquisition to the benefit of some of the military programmes. A very simple way of describing the opportunity that we do have is to compare the modern military engine with the modern commercial engine. The heart of the engine—the core, as we call it—in its technology and in the application techniques of that technology is entirely common. Round that core, if we want to design a modern combat engine, we put a reheat system on the back. If we want to design a modern civil engine, with low noise and good fuel consumption, we put a large diameter fan on the front, so that the fan and reheat technologies are inherently separate because of the vastly different application. But a great deal of the design of the engine and the technology that underpins it is common and that is an increasing area for dual use technology transfer in each direction. It is probably a fairly obvious illustration, my Lord Chairman, because a supersonic fighter does look rather different from an Airbus A320, and you would only expect at the level of materials perhaps that there are commonality opportunities in the design of an airframe.

(*Mr Peters*) Perhaps I may just add to that, my Lord Chairman. We work very hard at trying to identify dual use technologies. I can say in fact from my own personal experience that there are quite a number of programmes which are of joint benefit to both military and civil aircraft businesses and indeed within the company we make sure that the synergies are identified and exploited. They do extend a little beyond those that Mr Miller was mentioning.

385. Then on the Pathfinder programme, my Lord Chairman, may I ask whether you think that that is working well and perhaps there is then the question as to whether it should be run by the Ministry of Defence rather than the Defence Research Agency?

(*Mr Miller*) My Lord Chairman, I think that that particular question is for British Aerospace because there is virtually no aeroengine content in the Pathfinder programme. The arrangements that we have now described to you cover the forward planning of an integrated programme on the aeroengine side, so I will hand that question over to Mr Peters, if I may.

(*Mr Peters*) My Lord Chairman, industry certainly welcomes the Pathfinder process. We believe that it could be a good process. I think that at the present time it is too early to start forming any judgment. It has not been going for very long. Our current impressions are that it wants quite a bit of work to be done on it to sharpen it up and get the right sort of results and to get the right sort of response times. For example, my Lord Chairman, my company has submitted, I think, 128 proposals into the Pathfinder machine and so far as I am aware we have not yet received any contracts as a result of that. That is quite an investment as far as the company is concerned and one hopes that that investment will be repaid with some rewards in the form of contracts in due course. I think that it is fair to say that both industry and the Defence Research Agency are still learning how best to manage the Pathfinder process. I do not actually know that it would be any better or any worse if the Ministry of Defence were to run it rather than the Defence Research Agency. I think that we should probably

[Lord Renwick *contd.*]

rather stick with what we have got at the moment and try to make that work rather than change.

Chairman

386. But as a concept it clearly fits in rather neatly with your original suggestion of a stronger partnership at an earlier stage?

(*Mr Peters*) Yes, indeed, my Lord Chairman.

387. So that is what Pathfinder sets out to do as well as to deliver contracts?

(*Mr Peters*) Yes, my Lord Chairman.

Baroness Platt of Writtle

388. Both of you in your evidence mention the Technology Foresight enterprise which is taking off, and Rolls-Royce feel that the Defence Research Agency should be involved in it, and British Aerospace mention that at the moment it is driven by Ministry of Defence needs whereas it needs to have a broader view. If that is the case, how do you suggest that that might happen, because it is clear that if Technology Foresight is to be successful one hopes that it will be working on behalf of UK Limited?

(*Mr Miller*) My Lord Chairman, I should like to start on that one, if I may. I am sure that I speak for both companies in saying that we should hope to see successful development of the Technology Foresight process, which of course will take a little time to work successfully. It is an ambitious objective, but I think that it is one, as you say, that is very important for UK Limited. The interfaces between industry and various government departments are of course going to be focused in a number of panels of specialists. They are going to look at what the ultimate requirements might be, matching them up with technological trends, and Foresight in our view is very much an iterative process from these two directions. It is certainly not a linear process going from one end to the other. If you go back to the Government's White Paper last year which introduced the concept it was to us quite noticeable that the participation of the Ministry of Defence was quite small in this whole review. Although there is to our knowledge some participation already in the Foresight process we do not feel that it is balanced in a way that reflects the total research activity in the country as a whole. The research budgets in the Ministry of Defence are very large, certainly very large compared with the research budgets in the Department of Trade and Industry, and there ought in our view to be a more wholehearted integration and co-ordination of all government activity. We do not believe that there is yet sufficient openness between various departmental research programmes. Another illustration in the aviation community is the national strategic plan which has been led by the Department of Trade and Industry for technology acquisition. This is an activity that has been fully supported by industry and a good forward programme has been laid out, but with only a very small participation from the Ministry of Defence. That is another illustration, my Lord Chairman, of this lack of total co-ordination. We should make a plea for a great openness between departments and co-ordination, which is bound to be for the benefit of the country as a whole.

(*Mr Peters*) My Lord Chairman, I can only agree with what Mr Miller has said. He has encapsulated the situation not only as far as Rolls-Royce is concerned but also as far as British Aerospace is concerned. I think that there is one particular step which perhaps might help in this process of greater visibility to which Mr Miller referred. If, for example, the Defence Research Agency were to be charged with giving equal priority to considering and supporting the technology needs of industry at large as well as providing services to the Ministry of Defence this might actually broaden their horizons and increase the potential for them to add to the Foresight process and technology transfer process.

Chairman

389. But have they got the expertise to do that? How can they speak on behalf of industry, how can they anticipate industry's requirements?

(*Mr Peters*) My Lord Chairman, I think that industry is quite happy to identify its requirements to the Defence Research Agency. I think that also to a large extent it might be a question of the Defence Research Agency making more important information available on precisely what research they have in hand at a point in time, industry being able to access that information and then striking up a dialogue with the Defence Research Agency.

(*Mr Miller*) My Lord Chairman, perhaps I may add to the point that Mr Peters makes in answer to your last question. The dialogue in the Foresight process is intended to flow from industry to the academic community. I should see no difference between the capability of the research agency and the academic community to interpret industry's requirements. The Defence Research Agency does represent another pool of research expertise and an opportunity to do programmes similar to the academic community. Again it is a dialogue, it is a two-way process. I am sure the research agency could contribute to this in the way that the universities are beginning to respond.

Baroness Platt of Writtle

390. Would this not need a change in the framework agreement under which the Defence Research Agency operates in that there are definite limitations—we have had it and looked at it—in their aims, their mission and so on and the way they operate? There would need to be amendments to that, would there not?

(*Mr Miller*) Yes, indeed, my Lord Chairman. That would be a very big task and would need a very great deal of consideration, but I think that it would seem to us that it ought to be explored as to how that could be done and I think that it would be followed by considerable benefit—it would take a little time, but the benefit would follow in the long term.

Chairman

391. There is I think another important aspect that Rolls-Royce refer to in their written evidence. That is where you hint that you feel that the Department of

[Chairman *contd.*]

Trade and Industry and the Ministry of Defence do not always work as harmoniously as you would wish and that the Department of Trade and Industry sometimes finds it difficult to get information on Defence Research Agency programmes. This seems to be all part of the Technology Foresight exercise in that it is an iterative one and should try to bring all parties together. Do you think that it has a role here to fulfil or is it something that Government should be able to do for itself?

(*Mr Miller*) Of course, my Lord Chairman, the two government departments ought to be able to do it between them. In our evidence I think the particular instance that I mentioned a moment ago was the preparation of a national strategic plan for aviation technology. It is a very obvious opportunity for all different views and all different prospects for research to be put together, otherwise it is not a truly national plan. It was the limited co-operation that went into the preparation of that plan that we had in mind as we wrote our evidence. However, I do know that Mr Peters was very closely involved in the preparation of that plan and he might want to make some further comments.

(*Mr Peters*) Perhaps I may add to that, my Lord Chairman. I think that what Mr Miller says is fair comment. It has not been easy to get information from the Ministry of Defence and the Defence Research Agency on possible contributions that their research might make to the fulfilling of the requirements outlined in this national strategic acquisition plan. As to how that might be altered, I think you mentioned that the Department of Trade and Industry and the Ministry of Defence really need to get together and perhaps it is for Government or at least government departments to sort out the process by which the availability and visibility of this research information could be brought out. That is going on, I am aware, and the Office of Science and Technology are also involved in that process, so the problem has been recognised and government departments concerned are taking steps to try to overcome the problems, but as yet without complete success.

392. Do you think that the Office of Science and Technology have a lead role here to bring the future interests of the Department of Trade and Industry and the Ministry of Defence together?

(*Mr Peters*) I see them as having a catalytic role, I think, my Lord Chairman. I think that the Department of Trade and Industry are primed or nominated as the champion of industry in Whitehall—I think that was the phrase used, or something like that—so it might be argued that they should have the lead role, but in practice I think that the three departments are taking the problem seriously and working together on it.

Baroness Platt of Writtle

393. One always finds it difficult to get government departments working together rather than the sort of "not invented here" syndrome. Do you think that it would be better if the Defence Research Agency was "owned" by the Government as a whole rather than being directly responsible to the Ministry of Defence solely in the first instance which tends to exclude both the Department of Trade and Industry and the Office of Science and Technology?

(*Mr Peters*) My Lord Chairman, I find that probably the most difficult question in the list that was made available to us.

394. That is no reason for not asking it!

(*Mr Peters*) It is one that I should rather like to dodge, but I do not suppose that I can get away with that. I think that there is much in what has been suggested, that perhaps the Ministry of Defence is not the right place for the Defence Research Agency to be owned. However, that having been said, it is very difficult to try to identify where else in the government setup it would fit, so I think that on the basis that you do not change things unless you can see some very positive benefit in so doing I should probably come down on the side of leaving it where it is but actually changing its terms of reference to reflect this greater openness and partnership.

(*Mr Miller*) My Lord Chairman, I think that the final point that Mr Peters makes is probably the most practical suggestion that we can make, that as industry we have to run our businesses with many departments. I was describing the technology aspects of that. If openness between government departments could be encouraged, if not instructed, then that would gain I believe most of the benefits, without a further big upheaval in the administration which might put the forward path of science back by a few years.

Chairman

395. Would you like to comment on the LINK programme and how effective it has been in your experience?

(*Mr Miller*) My Lord Chairman, from the point of view of Rolls-Royce I think that the link between the LINK programme and our military defence work is very small indeed, so there is not much that we can say in the context of this Committee. But the LINK programme in general did suffer from a fairly slow start, a heavily bureaucratic start, which was the subject of a great deal of criticism from customers and participants. We have seen a considerable improvement and a considerable streamlining of the process in the recent past. I believe that it is now working quite well and we give it all the support that we can, but it is not primarily directed at military research.

(*Mr Ruffles*) My Lord Chairman, if perhaps I may add a point there, the LINK programme now requires I believe two industrial partners plus a university. If the Defence Research Agency were looked at in this context as a university, then it could become a natural part of the LINK programme. I am not sure whether or not the LINK programme allows that at this point in time. There is certainly no evidence of the Defence Research Agency being involved in it directly.

Lord Craig of Radley

396. My Lord Chairman, may we go back for a moment to your concern, Mr Peters, about competition between the Defence Research Agency and industry set against your wish for greater

[Lord Craig of Radley *contd.*]

partnership and certain regret that British Aerospace expressed about the Defence Research Agency's more commercial approach. In particular in your evidence you refer to the secondary competition. Perhaps you could expand a little bit more on your concerns there for us?

(*Mr Peters*) Yes, my Lord Chairman, I think that our worries are that in running these competitions the Defence Research Agency is fulfilling several roles all at the same time. It is there advising the Ministry of Defence, it is actually bidding to do the research work itself—it is a research organisation doing research as its business so that it has a direct interest in wanting to carry out research—and at the same time it is running a competition to carry out some research or making decisions on where research should be carried out on behalf of the Ministry of Defence. We feel that this is a pretty uncomfortable combination of roles for one organisation.

397. We have heard evidence about Chinese walls being imposed which would help to alleviate the problem. Do you have any view on that?

(*Mr Peters*) I think that I should merely refer you to Chinese whispers, my Lord Chairman!

Chairman

398. You have already made it clear earlier though not, I think, excluding Rolls-Royce, that you did feel you had not been able to talk so freely to the Defence Research Agency since their new role had been formulated, and it is clearly an interesting fact, where the relationship has been established over a longer period than Rolls-Royce, that there appears to have been less of an issue because you seem to have got a clearly defined role and you feel that that is threatened?

(*Mr Miller*) My Lord Chairman, that is absolutely true from the Rolls-Royce point of view, yes. We should not like to see any great disturbance in the arrangements that we follow at the moment.

Lord Craig of Radley

399. Perhaps we could move on to IPR, my Lord Chairman, where again British Aerospace expressed concern about how these conditions might be applied by the Defence Research Agency. I do not know whether this also reaches across to Rolls-Royce, but do you have any comments that you would like to give us on IPR?

(*Mr Peters*) I do not know who invented IPR, my Lord Chairman, but it is one of the most vexatious issues that any of us have to deal with. I think that it is true that we are unhappy with the current status of the Defence Research Agency in respect of IPR. We believe particularly that they are giving insufficient recognition for the company investment in money terms which goes into the various research programmes. We believe that that investment on the part of British Aerospace is not recognised in the IPR terms that the Defence Research Agency wants to impose. We are constantly in discussion with the Defence Research Agency on this issue. There are some hopeful signs, I think, that we are beginning to get a more reasonable situation, but I think that it is a very good example of where the more commercial approach of the Defence Research Agency has actually led to some difficulties in negotiating contracts with them. It is certainly not a comfortable situation.

Chairman

400. Is it because you feel that they are being rather hard-nosed about negotiating the share of the IPR rights?

(*Mr Peters*) I think we believe, my Lord Chairman, that they are adopting a more extreme position than we should expect if we were negotiating a similar situation with another part of industry.

401. As an extension of this issue over IPR rights one can imagine a situation that might arise where the manufacturing base in this country was not perhaps so appropriately matched to the intellectual property rights that might have been generated from the Defence Research Agency but nevertheless there might be some interest, though presumably if the interest was not properly matched the bid for those rights from the United Kingdom would not be as high perhaps as elsewhere. Do you think that the Defence Research Agency or perhaps the Ministry of Defence should have a responsibility to try to ensure that these property rights are exploited in this country for preference?

(*Mr Peters*) My Lord Chairman, I think that it depends on who has actually paid for the work to be carried out. If the work has been paid for out of the public domain then I should agree that there ought to be an obligation upon the Ministry of Defence or the Defence Research Agency to ensure the maximum exploitation of the IPR of that research work. It becomes more difficult I think where you have a shared funding situation, but again there are formulae that are commonly in use between industrial partners in this situation which enable the appropriate exploitation of the results of the research while safeguarding the investment that industry has put into generating the information in the first place.

402. But some would argue, would they not, on the first part of your answer where the taxpayer has paid the cost that it might be in the taxpayer's interest to get some added value?

(*Mr Peters*) Absolutely, I agree, my Lord Chairman, in that situation where it has been wholly funded by the taxpayer.

403. But the added value might be in terms of jobs in this country?

(*Mr Peters*) Indeed, my Lord Chairman.

(*Mr Miller*) There is less of an issue within the Rolls-Royce experience than there is apparently with British Aerospace, my Lord Chairman, which may be because of the monopoly situation that we have described earlier, and I do not know that I can say much more from our point of view on that.

404. If we may move then from the question of IPR, there is one issue that has troubled us a little. Previous witnesses have suggested that the competitive bidding is sometimes a fairly academic exercise and that it is difficult to have a proper competition and there is a danger that whole tranches of work in the Defence Research Agency might be

[Chairman *contd.*]

removed by bids which are probably designed to remove the opposition rather than provide a competitive service. Do you think that this is a real threat or do you think that it is contributing machiavellian attributes to industry which are quite unworthy?

(*Mr Miller*) Again, my Lord Chairman, this is perhaps an illustration of differences, but I do not believe that in the aeroengine sector there is any practice of competitive bidding. There is this collaboration in forward planning that we have described two or three times, and I will not go over it again, but perhaps Mr Peters would care to make a comment because there are more prospects of competition, are there not, from the British Aerospace point of view?

(*Mr Peters*) My Lord Chairman, perhaps I may just say a word about the impossibility of running a meaningful competition for a piece of research. Generally speaking if you have got a research programme you want to conduct you have got an idea of where you would like to get to and you have got a rough idea of how you want to approach getting there. Ninety-nine times out of 100 you will go a completely different route from the one that you expect to achieve the objective. Given that you do not know what the resources are going to be that are needed to get you to that objective it is very difficult, I think, to put a meaningful fixed price, as it were, against doing a piece of research work, and to my way of thinking running competitions for pieces of research tends to end up in a battle of glossy brochures—my glossy brochure versus Mr Miller's glossy brochure. You can bring in things like the quality of the research team and peer review and things like that, but at the end of the day it is very difficult to put a sum of money against a piece of research and say, "I will do that research for that money and give you these results", so I have a great problem with the whole concept of running competitions for research work in the first place.

405. So would your advice to the Defence Research Agency be to get out of this business of trying to run a competition on behalf of the Ministry of Defence for research?

(*Mr Peters*) Absolutely, my Lord Chairman, yes, and to enter into partnership arrangements for the benefit of UK Limited as a whole.

406. Because the Defence Research Agency are faithfully fulfilling the framework agreement that they have in which this is a requirement. I do not suppose it is DRA's choice—I do not know, we have not asked them—but you feel that the Ministry of Defence are misguided in setting up this competition?

(*Mr Peters*) My Lord Chairman, I think that the Ministry of Defence probably quite rightly see some benefits to them, the Ministry of Defence, in having this competitive situation created. I think, however, that if you take the broader view of what is good for the United Kingdom economy and for United Kingdom industry you come to a different conclusion, and I believe that if the Ministry of Defence were required to take a somewhat broader view they might actually agree with what I said.

(*Mr Miller*) It is perhaps worthwhile illustrating to the Committee, my Lord Chairman, another practice that we have in Rolls-Royce which supports the point that Mr Peters has made that it is actually difficult to run a competition for a particular piece of research. However, over recent years we have developed a number of what we call University Technology Centres each of which specialises in a particular area of technology which is of interest to our business, be it materials, aerodynamics, thermodynamics. At the setting up stage of these centres we do run a competition, and that is a competition between the teams, that is, between the reputations of the engineering departments that we are looking at. The aim then is to select one particular university's team to enter into a long-term partnership, and to conduct the research in the iterative way of technical ideas versus market requirements in the way that we have described before. I think that is a very practical way. It has been very successful for us, but not competing for particular research work.

407. That is not the flavour of the month in the Ministry of Defence, is it?

(*Mr Miller*) No, my Lord Chairman, but I am describing what we have found to work in a rather broader context.

Lord Craig of Radley

408. I think that what both of you are saying is that the concept of market testing in the research field is highly suspect?

(*Mr Ruffles*) My Lord Chairman, if I may just come in here, I think that what we are saying is that you should market test the team, not the particular research topic, and create a centre of excellence, and then continue to maintain that as a centre of excellence.

409. Do you then review over periods of time the work of that team after a period of doing as well or not doing as well and act accordingly?

(*Mr Ruffles*) Yes, my Lord Chairman, we do. We run typically a two-year rolling contract but with a five-year horizon and if a particular area is not performing well it stands the risk of losing that long-term contract. The individual work packages are then agreed on a day-to-day basis as the programme rolls on.

Chairman

410. So that we may be quite clear about this I should just like to read to you a statement by the Minister of State for Defence Procurement and perhaps you would like to comment on it afterwards, although you may say that you have done so already. "It is my department's policy that the work that the DRA carries out for the Procurement Executive should be subjected progressively to competition with the aim of achieving 100 per cent within four years. The DRA's 1993-94 targets include a requirement that it seeks competitive proposals in that period for secondary competition and subcontracts amounting to 3 per cent and 24 per cent of turnover respectively." Would you like to comment on that target?

(*Mr Peters*) I think that I am allowed to disagree, am I not! I can quite understand why the Ministry of Defence does take that line, my Lord Chairman, but I

[Chairman *contd.*]

believe it not to be in the best interests of the research community and certainly not of United Kingdom industry and the United Kingdom economy as a whole though it may actually—I doubt it—confer some benefits to the Ministry of Defence. I do still come round to the point that it is very difficult to run competitions for research.

411. Thank you. Mr Miller?

(*Mr Miller*) My Lord Chairman, I do not think that the Committee should take our comments as being general as regards market testing. We are saying that—

Lord Craig of Radley

412. I was asking in the research field.

(*Mr Miller*) Yes, research work I think in all our experience is much more successful if there is continuity in partnership, two heads better than one, three heads better than two. It might well be in a much larger infrastructure with a number of parallel think tanks, as in the United States, that research of that nature could be successfully competed, but I do not think that we have that infrastructure in this country and so the point does not really seem relevant to us.

Chairman

413. Thank you, I think that you make your views clear. Given nevertheless that you feel that the policy itself is misguided do you think that it is achievable, is it practical, to get 100 per cent over four years?

(*Mr Peters*) You can put a label round it and say that it is competition, my Lord Chairman, but whether it is meaningful competition I think is open to debate.

414. Lastly, perhaps we could deal with one or two specific points. Mr Peters, perhaps you would like to comment on your evidence where you refer to the equivocal role of the Defence Research Agency in various international fora giving rise to concern. We should very much welcome an elaboration on that.

(*Mr Peters*) I think that our concern, my Lord Chairman, comes back to this question of ownership of technology results of the research. We are aware that in the past the Defence Research Agency have been known to take packets of technology and enter into trade with other nations' research establishments which seen from their point of view is quite good; it is a way of increasing their access to research. However, we believe that those decisions are quite often taken without perhaps adequate evaluation of the impact of passing that technology to the new organisation, the impact of that on industry in the United Kingdom. We certainly are of the view that from time to time some of these trades are entered into without full consideration of what that impact would be.

Chairman] I think that we have more or less exhausted the questions that we wanted to ask, unless there are any other questions that members would like to ask?

Lord Redesdale

415. My Lord Chairman, I have one question which goes back to the research facilities. When we have talked of the research facilities in the past we have always been given the impression that in some cases they are under-used or they are just used by British companies. Are there any European customers for the research facilities that you mentioned?

(*Mr Ruffles*) My Lord Chairman, I am not sure that I am qualified to answer on that in this context. If you take the facilities, the noise facility possibly, but I am not sure; on the altitude facility, there is some possibility of European use although, as I said earlier, there is another facility for military engines in Germany. As to the other facilities, it is unlikely.

Earl of Dundonald

416. I have one very small question, my Lord Chairman, going back to Mr Peters and a point that is made in the written submission at paragraph 3.2(a) on United Kingdom wealth creation. It is just the question of time to market and perhaps you could elaborate a little bit more on the statement that was made, which I suspect may have something to do with intellectual property rights wanting to be slightly more grasped by the Defence Research Agency?

(*Mr Peters*) I am afraid that you have caught me out on this one, my Lord Chairman. May I let you have a note on it?[1]

Chairman

417. Please do, Mr Peters, that would be helpful. Are there any further points that you would have liked us to have referred to?

(*Mr Miller*) My Lord Chairman, I think that we have been given the opportunity to make all the major points that we have in our mind, so thank you for the opportunity.

418. Thank you again very much for helping us today. We have found it most helpful.

(*Mr Miller*) Thank you, my Lord Chairman.

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[1] See following page.

Supplementary memorandum by British Aerospace PLC on UK Wealth Creation and Time to Market

At the 24 February meeting of Sub-Committee II of the Select Committee on Science and Technology, BAe undertook to enlarge upon comments in its written evidence submitted on 6 January 1994, in respect of UK Wealth Creation and Time to Market.

In the competitive world of aerospace the time taken to develop, produce and market a product is becoming increasingly important to industry for three main reasons: firstly, development costs are directly related to elapsed time; secondly, the sooner the product can be made available, the sooner it will produce cash flow and enable borrowing levels and business costs to be reduced; and thirdly, speed to market can gain a significant competitive edge and capture a large slice of the market.

In the context of DRA research activities, BAe believes that any need to transfer technology to industry at a relatively late stage in its development cycle will introduce discontinuities and time delays in the product development cycle, primarily because of the need for industry to learn about the new technology, assess the role it might play and adopt design processes and procedures to accommodate the new technology.

Industry involvement at an early stage in the technology development process would significantly enhance the smooth transfer into products, improve the time to market and thus enhance wealth creating potential.

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HOUSE OF LORDS SESSION 1993-94

MINUTES OF EVIDENCE
TAKEN BEFORE

THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

(SUB-COMMITTEE II DEFENCE RESEARCH AGENCY)

Thursday 10 March 1994

CONFEDERATION OF BRITISH INDUSTRY

Mr J MacNaughton, Mr J Elliott and Mr R I Hawtin

THE ROYAL ACADEMY OF ENGINEERING

Mr I B Bott, Mr F W Armstrong and Professor J R James

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THURSDAY 10 MARCH 1994

Present:

Hilton of Eggardon, B.	Selborne, E. (Chairman)
Howie of Troon, L.	Trefgarne, L.
Platt of Writtle, B.	
Redesdale, L.	
Renwick, L.	Dundonald, E.

Memorandum by the Confederation of British Industry

The Confederation of British Industry, through its Contracts Panel, submits the following evidence to Sub-Committee II. This submission concentrates on the contracting and commercial issues only.

1. THE DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH MOD

1.1 *How independent of the MoD is the DRA?*

The DRA continues to be a part of the Ministry of Defence, as an Executive Agency, reporting to the Secretary of State for Defence. Almost all of its work is performed for the MoD. It is forbidden from undertaking work that is not part of its core research function unless that work is for MoD. It is reliant on MoD(PE) for some core facilities such as Contracts Policy, Accounting Services and Quality Field Services. It is difficult to identify any area where the DRA is independent of MoD.

1.2 *Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

The DRA's new status appears to be more of a hindrance since it is used to justify a change in DRA's method of interfacing with industry which increases DRA's costs and may make industry less co-operative. For example, DRA is establishing functions within its organisation that have hitherto been resourced from MoD (PE)—these will add to DRA's costs, require a learning curve and cause changes to the method of interfacing with industry. Also, now that DRA has some limited remit to compete against industry as a supplier for research services, industry may be reluctant to share its research results so freely with DRA and vice versa—to the detriment of Defence Research generally. Furthermore, there are various activities that DRA undertakes which create conflicts of interest or give DRA an unfair competitive advantage, for example:

(a) acting as the Competent Authority for the purposes of subsection 22(6) of the Patents Act 1977 in evaluating the military intelligence classification of the subject matter of patent applications;

(b) acting as adviser to MoD in the evaluation of tenders;

(c) acting as the Technical Authority of MoD in monitoring the performance of MoD contracts;

(d) receiving research reports resulting from MoD contracts;

where the DRA could use the information gained to further its "commercial" interests by competing with industry for MoD and other work.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

DRA is a customer of industry, a supplier of industry, and a competitor with industry.

As a customer, DRA has to avoid a conflict of interest arising between its activities for MoD and its non MoD initiatives. This has been discussed between DRA and the CBI, with DRA asserting that it will compartmentalise the information to avoid a conflict of interest; the CBI has not been convinced that information will not migrate across these artificial boundaries and be used to industry's disadvantage. The CBI is keeping a watching brief.

As a supplier to industry DRA has demonstrated an excessive unwillingness to accept risks normal to a supplier ie firm price, performance and delivery commitments. This results in a reluctance on the part of industry to contract work to DRA. Furthermore, where DRA has unique facilities, required to be used for the performance by industry of MoD contracts, this lack of commitment undermines a contractor's ability to perform the MoD contract and suggests that the Government is not acting in good faith when it holds the contractor to the contracted price, performance and delivery.

1.6 *How is the process of formulating a strategy for DRA being affected by the new thinking about defence and foreign policy following the end of the Cold War?*

Whatever new thinking there may be following the end of the Cold War it seems to be dominated by the need to reduce costs and budgets.

In order to assist the DRA in formulating a strategy the CBI believes that it is essential to identify core technologies which:

(a) the UK has an international lead in over other nations which should be maintained;

(b) the UK has the potential to move into a lead in;

(c) are relevant to major defence equipment projects and necessary to give the UK real influence in the negotiation of multi-national collaborative projects.

There may be occasions where the essential strength in a core technology is not available in the UK and the need to invest in the creation of both capability and capacity should be recognised and actioned. Without the necessary priorisation of defence R & D expenditure towards these core technologies optimum value for money will not be achieved and, perhaps more importantly, the capability of the UK defence industrial base may erode along with the unavoidable reduction in capacity which has taken place and continues to take place.

1.7 *How far should the DRA continue to provide [scientific and technical] services, and to whom?*

Certain facilities held and managed by DRA are unique in the UK and represent a national resource which should be maintained. Services based on these facilities should continue to be available to MoD and to industry. The DRA should avoid conflicts of interest arising from the exploitation of its resources.

3. DRA'S RELATIONS WITH INDUSTRY, EUROPE AND THE WIDER WORLD

3.1 *Is enough being done to link the DRA's defence-orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?*

It is important to increase efforts in appropriate sectors to link civil and military R & D to improve commercial exploitation of the results of R & D expenditure. The DRA "Pathfinder" scheme may help with this process and the wider ranging and more commercially aware dialogue with DRA is welcomed by industry.

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

(a) a viable market;

(b) a commercial enterprise which

  (i) becomes aware of the technology;

  (ii) can identify the potential applications and relevant markets in time to exploit those markets;

  (iii) has the necessary expertise and is prepared to invest in the development of the application of the technology to meet the market requirements;

  (iv) is prepared to invest in the necessary manufacturing, distribution and customer support facilities to meet the market requirements.

Many defence companies are not geared to exploiting the commercial market for derivatives of their products. Most non-defence companies do not plan their corporate growth on licensing-in technology; they are geared to addressing new markets with their own know-how and products. Defence technology is no different to civil technology in having difficulties in being exploited by third parties—compare the amount of patent licensing in the civil electronic and aerospace industries with the transfer of defence technologies into those industries from third parties.

If DRA was to make its technical information freely available to qualified recipients in the UK then the transfer of technology would have the best opportunity to move from the defence to the civil sector. The US Department of Defense Instruction 5200.21 of 27 September 1979, specifically requires the dissemination of Department of Defense technical information, limited only by consideration of security requirements and access restrictions.

3.5 *Has the DRA effectively filled the void left by the demise of Defence Technology Enterprises, and is the DRA any more likely to succeed where DTE failed?*

The answer to 3.2 above suggests that "success" or "failure" is more dependent on the skills of the possible recipient than on the originator or distributor of the technology. There is no reason to believe that DRA would be any more "successful" than DTE.

3.6 *What is to be the DRA's role in the issues of conversion and diversification in the defence industry as a whole?*

The responsibility for the conversion and diversification in the defence industry rests solely with the companies comprising the defence industrial base. However, in order to convert and diversify, companies need reliable data on which to plan future strategies and direction.

DRA can make a significant input to the planning of companies through its contribution in identifying core technologies to be retained, maintained or created. This would enable companies to plan their future involvement in defence projects and R & D programmes on the basis of known core technology requirements which are themselves fully supported.

3.7 *How should [DRA] relate to the part of industry which is not concerned with defence and how much should it focus on dual-use research?*

The main focus of the DRA must be on defence. However, the DRA should have an aim to achieve or facilitate the widest dissemination and exploitation of its expertise and results. This should not be taken to suggest that DRA should change MoD's contracting policy of leaving the ownership of patents, copyright and designs with contractors who do work for the DRA. It is the exploitation of in-house DRA work that is being considered here. Also, this should not be taken to suggest that DRA should become a developer or a manufacturer or in any way compete with industry.

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

There are no external signs of DRA avoiding conflicts of interest. The DRA is actively seeking to protect its Intellectual Property by replacing implied obligations of confidence with express provisions—thus creating anomalies with other parts of MoD and Government in general. The DRA is actively seeking to acquire Intellectual Property from contractors against MoD(PE) contracting policy. These steps would increase the DRA's competitive advantage over industry in addition to the aspects in answer to question 1.2 above.

Further conflicts of interest arise where DRA lets work to industry on a non-competitive basis and has to agree the price by negotiation. The terms of such a contract normally require the disclosure to DRA of the labour and overhead rates and factors used by the contractor to estimate the price of the work. Where MoD conducts a competition and the DRA is in competition with such a contractor, the DRA will have a competitive advantage over the company in the competition. Even where the contractor does not supply the DRA with those rates or factors, the DRA is being given free access to the data held by the MoD(PE) Defence Contracts Organisation's Pricing and Quality Services despite the CBI's expressed concern.

Examination of witnesses

MR J MACNAUGHTON, Director, Special Projects, EDS, MR R HAWTIN, Contract Director, Thorn Security and Electronics Ltd. and MR J ELLIOTT, Roke Manor Research Ltd., called in and examined.

Chairman

419. Mr MacNaughton and colleagues, thank you for joining us this morning. Would you like to introduce yourself and your colleagues first?

(*Mr MacNaughton*) I am a Past Chairman of the CBI Contracts Panel. To my right is John Elliott of Siemens Plessey; to my left Richard Hawtin of Thorn Security and Electronics. Between us we would lay claim to something in excess of 85 years commercial experience, much of which has been involved in research work, the protection of that work, the dissemination of that work and the exploitation of it.

420. You have had an indication of some of the questions we might ask, although inevitably I suspect we will stray off that list. Would you elaborate on how you see the DRA assisting in wealth-creation and could you comment in the light of the White Paper, "Realising Our Potential"?

(*Mr MacNaughton*) With your permission, my Lord Chairman, I will make an introductory statement. Then my colleagues will join in any way that they may wish. We start off with the fundamental principle that wealth-creation is traditionally the role of industry and that the role of governmental institutions has been to ensure that the basis exists for industry to create that role. To the extent that the Defence Research Agency is and remains a centre of technical excellence, its research should be funded by its customers, whoever they may be. The results of that work should be available for industry to create wealth by its exploitation. We do not see the DRA as an organisation as an asset or a disbenefit. The value of the asset really rests in the knowledge and skills of the people who are in DRA

[Chairman *contd.*]

and the tangible assets that they manage, such as the wind tunnels at Farnborough and so on. It could be any organisation; it is not DRA of itself which, if it has those skills, capabilities and assets, should be able to perform.

421. I do not know whether you were able to study the White Paper, "Realizing our Potential". Did you feel that the paragraphs and the content which referred to defence research and wealth-creation were something which made a relevant contribution to the debate?

(*Mr MacNaughton*) Defence research, yes, my Lord Chairman; we have no problem with that. We do not actually have a problem with the organisation that research is vested in either, at the present moment. What we were anxious to do, and I hope it is not confusing people, is to disentangle the organisation from the value asset which is within that organisation.

422. Could you say something about the organisation now? Do you feel the organisation which has been set up helps or hinders in this exercise?

(*Mr MacNaughton*) By "organisation" do you mean the trading accounts?

423. The trading accounts, status and accountability?

(*Mr MacNaughton*) Yes, the CBI view would see that trading account status as just a mechanism; it is not an influence for greater efficiency or performance or anything else. The improvement in efficiency and cost-effectiveness and value for money is a continually evolving process. There are a number of administrative set-ups that one can use to achieve the operation of the organisation you are in and its relationship with customers; the trading account happens to be one of those. There is no reason to suppose it is more or less effective than anything else. We do not believe that, of itself, it contributes to increased efficiency.

424. Would you believe that the terms of reference that the DRA is operating under and the framework agreement are logical?

(*Mr MacNaughton*) We have a slight problem with that. The 1991 framework agreement was the result of considerable discussion, in which the CBI were engaged as well with the DRA implementation team. When the document came out it was publicly available and was well understood. The 1993 framework document, to the best of our knowledge, was not generally available in the same way and was not preceded by any discussion that we can identify with external bodies like ours. We have obtained a copy and we have obviously looked at this and made comparisons with the 1991 framework document. Representing the broad base of industry, we are concerned about some of the differences that we see in it.

425. Could I refer to the great changes, what someone described as the turmoil, over the last two or three years, inevitable probably, bearing in mind the contractions required in the organisation. Would you like to comment from your perspective as to whether you feel that these changes have been sensitively handled and whether there is perceived to be a long term rationale to it?

(*Mr MacNaughton*) I do not intend to hog our side of the platform, my Lord Chairman. Basically I think we would like to put that into two parts. First, if we consider the way in which the changes have actually been managed by the management of DRA, I think they have done at least as well, if not better than some industrial organisations would have managed such enormous changes. In terms of the changes in the trading practice they are introducing, we do have some concerns about those changes in the trading practice. We are in dialogue with DRA about those changes and to the extent that that dialogue needs to involve the Ministry of Defence as well, they are included in the discussions that we are having. It is more a question of both sides actually standing back and watching each other to see what will happen.

(*Mr Hawtin*) To add to that statement, my Lord Chairman, there seems to be a degree of confusion on both sides, both the side of industry and that of the DRA, as to the exact role that DRA is to perform. I am focusing more here on those at the working level in trying to do the job on both sides. There is confusion certainly on industry's side, for example, over whether the DRA is to act in a totally divorced way from its previous parent, MoD, with respect to its commercial arrangements or it is to operate under the same commercial standards and practices as industry. One side of MoD will tell us quite clearly that they should be working under the same policies and practices, yet there are many schools of thought within DRA that will tell us quite clearly, no, they do not; they operate under their own remit. We find this very confusing and quite difficult to manage. We know that at the working level within DRA they face similar uncertainties and problems.

Lord Howie of Troon

426. I am looking at paragraphs 1.1 and 1.2 in the reply to our questionnaire. These replies seem to me to be, if not critical of the new arrangements, at least somewhat sceptical. You talk, for instance, of it being difficult to identify any area where DRA is independent of the MoD, about the new status being more of a hindrance in some respects, about certain things adding to the costs and you think that the remit to compete might be to the detriment of defence research. You see a conflict of interest arising and unfair competitive advantages. These all seem to me at least sceptical. Are you trying to tell us that the new status is a mistake?

(*Mr MacNaughton*) We are not talking about the new status related solely to the trading account status but what they are actually supposed to be doing, it is not a mistake; it is a matter of concern. Basically, people can change their organisations; they can change their terms of reference and the remit under which they are working. At the end of the day, we have to find some way of living with whatever evolves from this; both parties do. As it stands at the present moment, we can identify what was and we can identify what may be. You may call it enlightened self-interest but some of the "what may be" is not frightfully exciting to industry. Therefore, we would

[Lord Howie of Troon *contd.*]

like, in the dialogue that we are having, to influence the way that "what may be" actually turns out to be.

427. You require to see some changes made?

(*Mr MacNaughton*) Yes, changes in practices and procedures essentially; for example, we do have a concern that the moment you say to an organisation, "Financially you have got to stand on your own two feet, in other words, you must earn revenue", it will do whatever needs to be done to earn that revenue, regardless of whether that is the most effective way to carry out research within the United Kingdom. We also believe that the DRA will move from being a centre of technical excellence for specific research, which in the main is aligned towards defence requirements, into the industrial domain. If they are going to do that, we would like to know it for certain sure. Of course, that is denied in a number of quarters. We find the denial rather strange when we read some parts of the 1993 document relating to their remit. We find it even more strange when the DRA is putting out invitations to tender to industry in which is it asking how much it will cost for them to rent specific skills, i.e. consultants, from various companies, where the shopping list for those skills includes such things as Planning of Market Strategy, and Acquisitions and Mergers. We ask ourselves: Are these the sorts of activities that the United Kingdom research centre of excellence really needs to hire consultants for and, if they are doing so, why are they doing so? Perhaps if we knew the answer to the "why", our concerns and fears would go away. Unfortunately, in the dialogue that we are having, we do not get the answer to "why".

Lord Renwick

428. In your previous statement, Mr MacNaughton, you said in the "what may be" you cannot see much advantage to industry. In the "what may be", can you see the DRA providing MoD with as efficient a service as the defence of the realm demands?

(*Mr MacNaughton*) Within the money that is likely to be available to the Defence Research Agency from the MoD, it is unlikely that without doing something very farsighted, of themselves they will be able to retain a total technological capability for defence. Partnership is not only inevitable; it is highly desirable. It is how that partnership is brought about so that, if you like, what industry can best and most economically do, what the DRA can best and most economically do and how the two parties together can, again if you like, exploit it on a wider basis so that that exploitation creates wealth, some of which will go back into additional or new research as well. We have a need as a nation to achieve that. This is what we believe we are trying to do in our dialogue with the Defence Research Agency. Unfortunately, in that sort of dialogue you start tripping over lots of administrative detail and entrenched positions and so on. It takes a long time to deal with it.

429. You are saying in your evidence that the new format of the DRA gives DRA an unfair competitive advantage with industry. That is no basis for the sort of cooperation that you are saying is absolutely necessary to maintain DRA's effectiveness as an instrument to the MoD?

(*Mr MacNaughton*) Yes. I suppose really the problem revolves around the ownership of the results, the way they are protected, the way they are exploited and so on. I hope this is not taken the wrong way but intellectual property rights is a topic which makes the eyes of most normal people glaze over and some of us treat it as a bit of a hobby. Essentially a way of collaborating without actually cutting right through the conventional rights of ownership is the nirvana that we ought to be seeking. At the present moment the contracting regime that exists has been changed by DRA from that traditionally carried out over many, many years by the Procurement Executive of the Ministry of Defence. Those changes are actually causing a reflex action in industry where we say to ourselves, "Hold on. You only make a change for some particular reason". The only reasons that we can identify are really those which would drive a coach and horses through conventional ownership of the intellectual property rights situation that has pertained for many years. With what purpose? When we add that together to the sort of invitations to tender for consultants coming out from DRA, when we recognise that the financial constraints on them will cause them to look for work in other areas which they can only do if they have the right to use intellectual property, we say, "No, we will just stand back for a bit". If we are asked for examples of where we have actually been harmed, we would say we are not at the point yet where there are examples, where the interest of any owner of intellectual property has been harmed. What we are anxious to do is to shut the stable door before the horse bolts and not afterwards.

Baroness Platt of Writtle

430. I am going on to question 9.[1] I wonder whether you have examples of where the MoD has protected its property and also where the DRA might be actively seeking to acquire intellectual property from contractors?

(*Mr Elliott*) My Lord Chairman, as my colleagues have said, the question of the DRA protecting its own intellectual property is one of concern, we would suggest, for the whole of the United Kingdom. If it were motivated to operate on a commercial basis for the first time with people who feel they have to respond and do something they have not done before, they may dispose for purposes of relatively short term gain of some of their own intellectual property. As to the intellectual property generated during the course of work for MoD/DRA by the United Kingdom contractors, I believe we all will be aware that, as my colleagues have said, the tradition has been that the arising intellectual property has

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[1] Question 9 read as follows: In relation to question 3.8, can you give examples where MoD is protecting its intellectual property by replacing implied obligations of confidence with express provisions? Can you amplify what anomalies this creates with other parts of Government? Can you give specific examples where DRA is actively seeking to acquire intellectual property from contractors against MoD (PE) contracting policy?

[Baroness Platt of Writtle *contd.*]

been owned by the contractor, with DRA or MoD having the right to use it for its own purposes. It has been owned by the contractor, giving those contractors the confidence that, subject to national security regulations and the like, they can exploit it and have the confidence to know that they can go out in the marketplace to do so. Over the last three years, reflecting these differing views within the DRA as to their role, we have seen evidence of elements of the DRA insisting that they must own the intellectual property which a contractor is generating for them. We say to ourselves, "If the DRA does not have the wherewithal to go out into the world and exploit that—if that is not to be its role—why should they want it?" Equally, from industry's point of view, since we are conscious that we are receiving the taxpayers' money, we have to say to ourselves, "If we do not own those designs, we do not have the copyright, we cannot own the patents, then we have done that work and it must stay in a drawer in the future". It is in those areas that we feel there is possibly no overall plan to deny us but there are certainly elements and sectors which believe, for some reason which we can only begin to guess at, that the DRA wants to own that arising intellectual property.

431. I am now in a way going back to question 8. I was very interested in what you said about what happens in America, that the US Department of Defense has another instruction specifically requiring the dissemination of technical information. Obviously you feel, from what you have said, it is not good enough. I wonder how it could be bettered here. I wonder, if the DRA were not just responsible to the MoD but had some kind of DTI input or else if they were responsible for wealth-creation as well as defence, whether something like that could alter the balance so that you saw a better future from the point of view of cooperation between the DRA and industry.

(*Mr Elliott*) Yes, I think, as we remark, that in respect of a comparison or contrasting with the United States, it is difficult to make one because that is not the practice here. Perhaps what we feel dissemination should consist of is at least a statement of the areas of technology that have been generated, the nature of the technology that is available, without publicising every bare detail, because then every person or every company in every part of the world would pick it up, but sufficiently so to say to UK industry, "If there is very valid technology lying there in the DRA that is not being used, use could be made of it". As to whether that be through the DTI or otherwise, I have not really given any thought, I have to say.

432. Or else perhaps through Technology Foresight through those working parties?

(*Mr Elliott*) Yes. There was a proposal some years ago for lodging this information in a depository where independent people could perhaps analyze it, first of all. There have been one or two companies, I believe, that established a set-up to do that but perhaps have not been successful so far.

(*Mr MacNaughton*) The reference that has been made to Technology Foresight needs to be discussed a little further. To do this as a single snapshot in time is not adequate. There has to be a regime set up which will continue until a better regime can be developed. We believe in actual fact that there should be a research centre of excellence in the United Kingdom. We see no reason why that should not be based on the Defence Research Agency, without the Defence Research Agency losing its first charge, which is actually to carry out research or our response to trade and so on, for defence, but you can plug the other bits into that. One of the problems that we are encountering increasingly is that it has always been difficult to find out what DRA actually knows or has available. I was for several years the Commercial Director of the Plessey Company. They would talk to that company about those things which in their opinion were specifically of interest to the relationship between the defence procurement side and the Plessey Company's observed skills and activities. We were unable to access any other information that was available. That situation is becoming even worse now because if you want to access the information you need for a specific purpose, the Defence Research Agency is asking for express terms of confidentiality to be entered into. Hitherto we have always worked, for decades now, on the basis of implied terms of confidentiality. Again, it may be a very hair-splitting concern. Industry is very worried about why government, which in one sense is a single body, should be prepared to work on implied terms right across the board but one part of government—and DRA is still one part of government in one sense—wants express terms. We do not really mind whether we have express terms or whether we have implied terms. What we are concerned about is that if you have got one part of government that is asking for express terms, what are the implied terms that you are entering into with the rest of government actually worth? They may be worth nothing. Hence, confidentiality ceases to exist. It is another hair-splitting argument which makes the eyes of normal people glaze over as well. Nonetheless, it is something which concerns us.

Lord Trefgarne

433. I wonder whether Mr MacNaughton is being wholly fair. Picking up a point Mr Elliott was making, he touched briefly on the existence of a company that was put in place to help disseminate some of the intellectual property. It was called Defence Technology Enterprises and it failed. It failed because industry did not take up the opportunities that were offered. They may have been rather inexpertly offered. Perhaps they were being offered on terms which industry felt were not sufficient attractive, but the fact is that that well-meaning exercise did not bear successful fruit. I wonder how the DRA might, in your view, do things differently so that in future the take-up of these good ideas is more widespread and more effective.

(*Mr MacNaughton*) I apologise if I seem to be unfair. I am not trying to be fair or unfair. I am trying to make a point. The questioner perhaps will recall that I was involved in the discussions which led to the setting up of Defence Technology Enterprises. It is often said that when good ideas were pulled out of the

[Lord Trefgarne *contd.*]

hat, the necessary high risk funding was not available and that was one of the reasons why it failed. We actually had a venture capital firm in DTE to overcome just that problem. While that may have been the case, it was not the cause of the failure of the DTE. We coined the phrase "ferrets"; they would burrow around in the Defence Research Information Centre where there are sanitized versions of the results of development and research work. They would also burrow around within the various Research Establishments, as they then were, and would suddenly one day cry "Eureka!". It was the "Eureka!" that Defence Technology Enterprises would offer for exploitation. I think that we collectively were a little naive in believing that that would actually work. If I could give you an illustration very briefly of the difficulties that were involved, let us suppose hypothetically that the gunners wanted a better lining for gun barrels than the one they have at the present moment and research contracts are let out. Let us suppose—this is a trade mark but I do not think I am infringing anything by using it—that the result of that research came up with Teflon. Now the Ministry of Defence and the gunners have their better coating or lining for a gun barrel; the manufacturer of gun barrels has met the requirement, assuming he produces the research in the first place. In 99 per cent of the cases it will stay there because some companies are narrowly focused on the market sectors in which their strategy has said they are going to use their skills. You might have somebody who actually spots an alternative advantage. We have to go back some years now because the housewife's dream some years ago was actually the non-stick frying pan. If you make gun barrels, do you actually want to become a frying pan manufacturer? The answer probably is no, if you think about it, because it is a new market; it is a new method of selling; there is a distribution chain, you do not really know what you are doing. So there is a huge chance then. You may think of it but you do not do anything with it. Now, the odds on Teflon being used for much wider exploitative purposes are very small but let us suppose the company is even more far-sighted than that and it talks to frying pan manufacturers. Let us suppose there are six frying pan manufacturers; five of them will not be interested in the high value being placed on the market that sticky frying pans represent when the average housewife has to buy two a year because whatever they were frying stuck. But one frying pan manufacturer thinks that he can charge a premium price and he can actually take a greater market share, so he will want to do it but he is left with the problem that he does not have the technology of how to get Teflon, the inherent quality of which is that nothing should stick to it, to actually stick to a frying pan. Now he requires technological assistance from somewhere. I have used that illustration on many occasions to try to impress upon people that the transfer of technology from the area that it was originally intended to be used in is not as easy as people think. To come back to the original point, and I apologise for digressing, you might have publication of that which was available within the DRA, that which was available within the other generators, all pooled together. In some cases I would even include industry as a generator, though it is guided by slightly different motives because a lot of things we see as being important to commercial competition, therefore, we do not want to have them generally available. I think we have to overcome that problem as industry. If this shopping list is generally available, people can actually look at it. It is just headline material. They can see exactly what knowledge is available to which they can gain access. We believe that such a shopping list would be of very considerable advantage to SMEs (small and medium enterprises).

Lord Howie of Troon

434. I have a vague notion, my Lord Chairman, and I may be mistaken, that the skin on the dome of the mosque in Regents Park is covered with something not unlike Teflon. Lord Trefgarne asked at least half of the question I wanted to ask which was about how best you could go about actually transferring technology, other than merely transferring information. I am wondering if you could say something about that. For instance, what about the transfer of people?

(*Mr MacNaughton*) That is a very interesting point. This is taking place not so much in terms of transfer of people at the present moment but in people from industry working together with scientists from government. It is in its very early stages. We actually think that is quite a good way of doing it but actually transferring people in the absolute sense of the word "transfer", no, because they are an asset of the company that is actually employing them.

435. They might be poached, of course?

(*Mr MacNaughton*) That is a risk that we have always lived with, I am afraid. Yes, they may be poached.

Lord Trefgarne

436. On a slightly different point, we heard from the DTI earlier on that the relationship between themselves and the Ministry of Defence, and hence the DRA, was improving. I am not quite sure what evidence they were able to produce to sustain that proposition. I wonder what your view would be of that relationship and whether you think we can be confident of DTI assurances?

(*Mr Hawtin*) I think we in industry do not see any evidence of things improving. That is to to say, they might be but we do not see any evidence of improvement between DTI/DRA/MoD. We are aware of a greater thrust by DTI to involve itself with DRA through seminars, symposia and with academia but, in terms of industry recognition, as I say, we do not see evidence of it. However, we fully support there being a link. We have talked quite exclusively about the defence research capability which, of course, is very important, but particularly over the last handful of years, not least since the Cold War drew to a conclusion, it is very important to us in industry to consider the civil/commercial threat every bit as much as we consider the military threat. If there were a vehicle that we could (a) see and (b) take part in, of DTI getting some analysis, some

[Lord Trefgarne *contd.*]

recognition, identification of the civil/commercial threat to UK Ltd. fed into DRA to put some of its research capabilities towards, we would wholly support that.

Lady Hilton of Eggardon

437. Whilst we are talking about the DTI and MoD, they claim, of course, that DRA is now more efficient and they claim they deliver the things and achieve their milestones more effectively, going up to something like 80 per cent. Of course, one can set milestones distances apart and set more realistic milestones rather than increased efficiency. We have been talking a lot about the problems of the relationship with DRA. I wonder if you find them delivering their responses more rapidly and more efficiently in that sense, despite all the other problems you have been identifying?

(*Mr MacNaughton*) Efficiency comes in many forms, some of which can actually be audited and measured and some of which is self-proclaimed and therefore lacks a certain credibility. If we as commercial people, which is what we three are, quantify it by the speed at which contracts are placed and the difficulty of negotiation for quite simple requirements, then one would have to say that the efficiency is lower than it used to be. If you look at some other aspects of performance like whether they meet milestones, and so on, or because of the way they beat contractors about the head to meet their milestones, one must assume this feeds through into an improved delivery against milestones to the procurement executive, their customer under the current arrangements. Beyond that, we do not really have any way of qualifying this. However, I would like to draw attention to the 1993 Framework Document. In the 1991 Framework Document the tangible asset value of the Defence Research Agency was £800 million. In the 1993 one, which we had some difficulty getting hold of, it is actually under £200 million. I work in a commercially profit-motivated organisation. If in two years I would have reduced my shareholders' assets by that amount, I am sure someone would be asking me some very, very strong questions. It could be accounting; it could be all sorts of things. I mentioned the implementation phase earlier. Again, I was involved in those discussions. We were very concerned that the transfer of some of the national assets which had high capital value into the Defence Research Agency should not be done in an accounting framework which actually caused them to be ridiculously expensive; in other words, they needed some easement if they were to have the whole value put in there. Equally, of course, if they were to be given all of these national assets, paid for by public funds on the vesting date for nothing, then in price terms alone they would have a very significant advantage over industry. It may just be that the movement between a very high level of asset value within two years to a much lower asset value has something to do with that. We do not know. We are not involved in it.

438. Some of it, may of course be due to selling off the land and buildings and things like that.

(*Mr MacNaughton*) That may well be the case.

439. They have thirty sites.

(*Mr MacNaughton*) We do not know. All I am saying is that on the information that we do know, if that was all my shareholders knew, I would be in trouble.

Lord Redesdale

440. In paragraph 1.6 you refer to the need to identify core technologies upon which defence research and development funds should be prioritised. I realise you are not overly enamoured with the foresight exercise. I was wondering how you would see this undertaken?

(*Mr Elliott*) Could you clarify for me the previous point to which you were referring?

441. It is paragraph 1.6, the third paragraph down.

(*Mr MacNaughton*) Perhaps I will lead in briefly. We did work on this beforehand. There is a mass of technology flowing around at the moment in all sorts of sectors. There probably is more technology than we really need to maintain a leading edge in order to be technologically comfortable in the defence world and commercially competitive in the whole world outside the United Kingdom. What we are not very good at doing, certainly in industry, is actually focusing on our research bank, if you like, and making the maximum use of that. Of course, the problem is compounded when you look at it on a national scale. If we just consider the DRA concentration on defence for the present moment, even though there is a high degree of uncertainty about what our defence obligations and therefore requirements for technologies will be in the future following detente, nonetheless, you can already identify some core technologies which must be maintained for military technology to stay ahead. We need to find some way—and if DRA were to be the catalyst that would not be resisted by industry—of identifying from all of the technologies available what we should really be backing, both governmentally and through the private sector. We are not very good at it at the present moment.

(*Mr Elliott*) Perhaps I may supplement that. I apologise for my initial lack of familiarity. One area we suggested in terms of bringing something to the fore of core technologies and industry has been—and it may be relevant in this context—the Pathfinder programme, in the sense that industry has been suggesting to the DRA areas that it thinks ought to be addressed and making suggestions for cooperation and working with the DRA in the future of this programme. Industry itself, of course, each industrial organisation, is familiar with its own core technology but has made suggestions in that field. These suggestions were put forward just over a year ago. Many were received. I believe about 600 are being evaluated by the DRA.

442. In paragraph 1.7 you express some concern over the future of certain facilities which are unique to this country and held and managed by DRA. How do you see their future?

(*Mr Elliott*) If some of those facilities which are crucial to the United Kingdom's future were not available, clearly that would be a threat. My colleague has referred to the assets being run down by

[Lord Redesdale *contd.*]

value at least, as we see, by the superficial figures. We obviously would have concern if someone for commercial reasons were tempted to sell something which was unique to the United Kingdom's industry. There have been examples of those, of wind tunnels, of engine testing houses, of sea state environments, that only the DRA itself has had. Therefore, UK industry has been able to make use of them in performing those contracts. If those were not available, there clearly would be some threat.

Lord Howie of Troon

443. In your paragraph 3.7 you show a lack of eagerness for DRA to become a developer or manufacturer or to compete with industry. I quite understand that. What do you feel about the DRA competing as a consultant with other commercial consultants which is a much smaller area?

(*Mr MacNaughton*) Providing we can satisfactorily resolve the conflict of interest issue, we are quite relaxed about that. The real problem is conflict of interest that arises from, if you like, the dual role that DRA has if it is both customer and supplier at one and the same time; to many of us it just creates a problem. If we could resolve it very quickly, I think both parties would be happy.

444. If it is merely restricted to consultancy rather than supplying you, would you be more relaxed?

(*Mr MacNaughton*) Not necessarily so; the concept of Chinese walls has yet to be proven to be totally effective!

Chairman

445. In your written submission you made it fairly clear you had some reservations about that concept. I am afraid we have now run out of time. We have other evidence to take. We are most grateful to you for the time you have given us. There will be, I suspect, one or two other questions we would have liked to ask. Perhaps we might write to the CBI asking if you would give us some further written evidence if it is required.

(*Mr MacNaughton*) Certainly, my Lord Chairman. Thank you very much indeed for your courtesy and for treating us so kindly with your questions.

Supplementary Memorandum by the Confederation of British Industry

In para 1.5 you note that, as a supplier to industry, DRA has "demostrated an excessive unwillingness to accept risks normal to a supplier, ie, firm price, performance and delivery commitments". You add that this results in a reluctance on the part of industry to contract the work to the DRA. Can you illustrate the problem and explain more fully its consequences?

When undertaking work for the Private Sector DRA are generally unwilling to accept delivery, price and specifications as contractually binding. This is particularly difficult for the Private Sector performing a contract for MoD under taut conditions of contract where either DRA is a nominated sub-contractor or is the sole source of specific skills and facilities, and increases the risk where DRA is contracted to do research for the Private Sector for commercial purposes.

March 1994

Memorandum by the Royal Academy of Engineering

The Royal Academy of Engineering is the United Kingdom's independent self-governing body of professional engineers of all disciplines. The Academy's objectives are the pursuit, encouragement and maintenance of excellence in the whole field of engineering in order to promote the advancement of the science, art and practice of engineering for the benefit of the public. By recognising Britain's most distinguished engineers The Academy aims to take advantage of their wealth of engineering knowledge and experience. The interdisciplinary character of The Academy's membership provides a unique breadth of engineering experience with which to further all forms of engineering.

This response is a collation of views from Fellows of The Royal Academy of Engineering. It cannot reflect the views of all contributing Fellows nor those of The Academy as a whole. It may, however, be regarded as representative.

EXECUTIVE SUMMARY

This response is a collation of views from Fellows of The Royal Academy of Engineering, the United Kingdom's independent self-governing body of distinguished engineers from all disciplines. In the answers to the questions posed by the Sub-Committee it is stated that:

> the independence of the DRA is severely circumscribed through its ultimate control by the Secretary of State for Defence.
>
> it is too early to comment on the DRA's status as a trading fund and the effect this has on its role. The DRA will become more cost conscious but more prone to take short term decisions on support for major facilities.
>
> there is an inherent conflict of interest within the DRA in advising MoD customers on the merits of R&D proposals from a variety of providers which may include the DRA itself.
>
> formulation of a coherent strategy for the DRA is extremely difficult particularly when there appears to be no end to the uncertainties in sight.
>
> DRA staff must have experience of experimental development, of operations and academic research. The establishments which now constitute the DRA have a long history of providing a variety of services other than research to the MoD.
>
> restructuring will contribute to the DRA meeting its new financial challenges but excellence has far more to do with establishing determination to be the world's best.
>
> if it is to succeed, the DRA should have complete freedom to set salary levels and to recruit and retain specialist staff. A vigorous and interesting research programme is necessary to retain expertise and to continue attracting scientists and engineers of the highest calibre.
>
> the DRA can advise on how current and future requirements may be satisfied but it is the MoD's responsibility to identify future defence needs.
>
> there are benefits in linking civil and military research programmes but defence research objectives should be set to meet defence requirements. The DRA is seen as a major national resource and attempts should be made to exploit defence research findings.
>
> now that the DRA is operating as a trading fund it should be regarded as an industrial partner for the purpose of the LINK rules.
>
> the DRA is unlikely to have a major role in the issues of conversion and diversification in the defence industry.
>
> the DRA should focus on defence first but should be free to undertake research for any customer subject only to national security and commercial confidentiality.
>
> there are dangers in introducing significant competition since if the DRA, industry and other institutions are driven into commercially adversarial positions, this could undermine the mutual trust and confidence on scientific and technological matters. It is more important to encourage collaboration, and the exchange of ideas and information, than to maximise competition.
>
> the MoD has no responsibility for wealth creation or for the health of the UK defence industry. This is in stark contrast to the policies of France and the USA where defence exports are recognised as

extremely important. Surprise has been expressed by other nationals on learning of the emphasis on competition adopted by the MoD in setting up the DRA.

RESPONSE TO QUESTIONS

1. THE DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH THE MOD

1.1 *How independent of the MoD is the DRA?*

The DRA, as a 'Next Steps' agency, has a measure of independence from MoD but this independence is severely circumscribed by the following factors:

The Chief Executive is appointed by and is accountable to the Secretary of State for Defence, who is supported by an advisory board and secretariat within MoD that scrutinises and, in effect, approves the high level business plans and annual plans of the Chief Executive;

The extent to which the DRA may undertake work and invest in capital facilities to attract and support customers other than those in MoD is artificially constrained;

All borrowing to rationalise and develop the DRA is a charge to the defence budget;

The DRA is currently dependent on customers within MoD for over 90 per cent of its income;

The historic interchange of many civilian MoD staff serving in DRA and vice versa has created a "club" which, whilst helpful in generating trust between the two bodies, means that changing the organisation's title changes methods rather than gives real independence.

The DRA attempts to be as independent as possible of the MoD but it is difficult to see how the DRA can be truly independent when its stated aim is "to provide independent high quality, efficient and cost-effective scientific and technical services to its customers, primarily MoD." Both organisations are mutually dependent on each other to fulfil their separate missions. An arms length customer/supplier relationship is being energetically pursued with the Chief Executive seeking as much freedom as possible in how he organises and manages DRA whilst wishing to be seen as part of MoD: a "partner" and "impartial adviser" to the MoD users of research and project support, rather than just another contractor seeking MoD work.

As the DRA accords priority to MoD requirements, as the major source of funding, these can raise difficulties in attracting work from outside as customer enquiries often require a rapid and positive response with cost estimate. Work can be lost to other European research organisations due to lengthy consultative actions within the system. The ability to undertake outside work should enable the DRA to sustain expertise which any MoD programme may tend to lose due to its current focus and priorities.

1.2 *Is the DRA's new status as a trading fund a help or hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

It is too early to answer this question. The process of preparing the DRA for trading fund status has been very difficult, both for the DRA in reorganising itself and acquiring adequate financial and management tools, and for its MoD customers who have had rapidly to introduce formal interface controls in place of the previous informal relationships. This has been very demanding at a time when internal resources are being cut quite heavily and many other initiatives are under way to change quite radically the programme organisation and procedures of the MoD.

In the longer term the change in DRA's status will be advantageous once it is a sharper, more efficient organisation focusing on customers' needs and the timely provision of results and advice.

The trading fund, whilst providing the most flexible financial regime available to the Chief Executive at this stage of the development of the DRA will, through financial targets, pressurise the DRA to rationalise its estate, facilities and manpower to minimise the value of capital assets and running costs. (See also Appendix 1).

Negative aspects of the change include the restrictions on borrowing (see 1.1), together with an obsession with methodology and multiple re-organisations which has taken precedence over research. There has been a loss of a significant number of high quality researchers, which in turn makes the DRA less attractive to highest quality recruits, with the consequence that the provision of the best quality research is becoming more difficult. This process is difficult to arrest and reverse. The deployment of many of the best scientists and engineers to implement managerial and other changes and excessive trading fund bureaucracy must also have reduced DRA's capacity to fulfil its role.

1.3 *How does the DRA's status affect its research strategy?*

The DRA's status as an agency of the Secretary of State for Defence preserves its position as a Government Research Establishment thereby facilitating the vital interchange of information betweeen allied Governments. No significant impact is perceived to flow from the new status of DRA since, in theory, the change in status should not affect DRA's research strategy as the research requirements were always meant to be set in response to wider defence needs. In practice, the DRA's new status gives it rather less "say" in the setting of the requirements thus causing it to concentrate on work for which the MoD is prepared to pay, rather than work which individual departments in the DRA would wish to pursue for their scientific interest. The need for some "blue sky" research is recognised but will be under rather clearer control—something like 10 per cent of the total research funding is a reasonable percentage for such research.

DRA is becoming highly responsive to customer needs and less inclined to pursue lines of research simply because they are the fields of science in which the staff are expert.

Trading fund status will tend to make DRA more cost conscious but more prone to take short term decisions on support for major facilities. For DRA to develop elements of an independent strategy, it will be necessary for MoD prices to include agreed margins for private venture exploratory research.

1.4 *How has the MoD's systems of Research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading Fund Status?*

The effect of NMS and Trading Fund status will be to squeeze DRA size and resources through customers' budgets. The DRA has set itself extremely demanding efficiency measures to be achieved in a very short time. The continued downward pressure on the Defence Vote renders it unlikely that the DRA will get the period of stability of Strategic Plan that it desperately needs after such a traumatic shake-up.

It is too early to comment fully on the changes but is is noted that the bureaucracy has increased and there is much scope for further development of the Research Package management system. The Research Package managers do not yet appear to be using the financial leverage they have to any significant extent. The internal MoD systems for assessing the effectiveness of research decisions taken by Research Package managers and calling them to account are immature.

One anomaly which has been noted is that virtually all the strategic and applied research funds are held and distributed by the Chief Scientific Adviser and Deputy Chief of Defence Staff (Systems) respectively. That tends to give too little voice to the Chief of Defence Procurement (CDP), who eventually has to use the applied research outputs in support of new equipment development. CDP does control the funds for direct Project Support by the DRA i.e. the advisory, theoretical, modelling or experimental work to support the development and design for a specific procurement project. But that means that CDP is often in a better position than CSA and DCDS(S) to understand the applied research needs for forthcoming projects—as well as, in many cases, having more of the expertise (particularly in engineering terms) to assess the output.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

The DRA's new status should provide it with a greater degree of freedom to provide services to other Government departments and private industry. There is however an inherent conflict of interest with the DRA in advising MoD customers on the merits of R&D proposals from a variety of providers which may include the DRA itself. Considerable scope for the clashing of priorities exists in these relationships, especially in the balance between extramural and intramural research. Industry is not fully convinced that optimum choices will be made in this area, especially in cases where there could be "competitive" teams inside the DRA and extramurally.

After a long period of trying to define its relationship with UK industry there is a recognition by both sides that there will be little direct competition but that DRA will become a much sharper customer (contractually). The DRA has affirmed that its business is to serve MoD's needs for specialist services. Its aim is to provide a service that industry could not possibly match for knowledge or price and will concentrate on these areas. This policy is likely to minimise friction with industry, with whom they seek partnership rather than outright competition. The introduction of competition is nevertheless a fundamental and very important change with negative implications for the strength of the UK defence industry as compared with that in other countries. This applies to international co-operative projects as well as international competitions.

1.6 *How is the process of formulating a strategy for the DRA being affected by the new thinking about defence and foreign policy following the end of the Cold War. Among the factors that might have to be taken into account are:*

- *the shift in focus of defence policy from the East-West confrontation towards more localised conflicts such as the Gulf, Somalia and the former Yugoslavia, together with concern about proliferation of weapons of mass destruction, with possible consequent changes in equipment requirements;*
- *the combination of downward financial pressure on the defence budget and upward pressure arising from the desire to incorporate ever newer technology into military equipment;*
- *the effect of State sponsored and other forms of terrorism on the roles and equipments of our Armed Forces;*
- *the question of how, in such circumstances, to determine which are the technological capabilities that must be retained within the UK in general, and the DRA in particular.*

The factors listed are of considerable magnitude and they continue to evolve in a turbulent way. Formulation of a coherent strategy affected by these factors is extremely difficult particularly when the situation of uncertainty shows no end in sight. Customers' budgets will determine many of these issues, particularly the budgets of Operational Requirements staffs; hence the question of a strategy for the DRA affected by the issues listed is somewhat academic when the real question is "what is the MoD's strategy?" A defence review is necessary and joint decisions need to be reached on the retention of techonological capabilities.

There is awarness of the need for rapid take up of technology but much of this is being driven by MoD procurement from a viewpoint of use of "off the shelf" technology. DRA, in some areas, still lacks awareness of the need to focus its resources on areas of maximum need. If the "Front Line First" and similar savings measures result in it being concluded that the Services must purchase a larger proportion of their equipment from abroad, then it will become difficult to justify the continuation of corresponding areas of research in the DRA. In the unlikely event that some mechanism were put in place to encourage the UK defence industry in its foreign currency earning role, then there would be a very strong case for protecting the funding level of the DRA against any further cuts (other than any that may still be required for reasons of internal efficiency).

1.7 *The DRA, like is predecessor organisations, has as its primary role the provision of research services to the MoD. In the past, however, the defence research establishments have also provided other (non-research) scientific and technical services to the MoD (significantly so during the Falklands and Gulf conflicts), as well as to other Government departments and private customers. How far should the DRA continue to provide such services, and to whom?*

MoD customers were relieved to hear DRA declare that their objectives is to provide MoD with specialist services since MoD recognised that in many areas it would be difficult for industry to provide such a knowledgable and expert service. But for DRA to provide sound and respected advice to MoD and/or to be inventive its staff must have experience of experimental development and of operations as well as of more academic research. This implies that DRA must have in-house some experienced and adaptable scientific and technical service groups (test facilities, trials teams, experimental workshops, hardware and software teams etc). A particularly difficult issue is the ownership and funding of major test facilities which are essential both for operational effectiveness and for research, but which may have low utilisation. DRA might suitably undertake the provision of such services for national (or international) use under separate financial arrangements.

Much DRA support goes beyond a narrowly defined concept of research services but is a natural extension of research activities, exploiting the scientific and technical expertise of the DRA and the close and beneficial association that exists with the end user. In many cases only the DRA has the expertise or facilities to undertake the work: also MoD often needs DRA assistance in assessing procurement tenders from industry and in supporting collaborative discussions with other countries. Often this can work if the DRA is accepted by industry and by other countries as beind impartial and part of Government. DRA should be free to continue to provide or expand such services to MoD and other Government departments, subject to the DRA providing value for money demonstrated by market testing by the customer. It should be free to supply those services on commercial terms to other customers.

A further point worth addressing is the apparent emphasis on Research whereas many sections of DRA were originally created to provide Design Support. This the Ship Towing Tanks at Haslar and Wind tunnels at Farnborough were primarily created to provide performance predictions for ships and aircraft and, were necessary, advice on modifications to designs to improve performance or eliminate bad features. To some extent research was conducted as a supporting activity to the improvement of test techniques and performance prediction. During the 80's Haslar was heavily involved in design support to new designs of Warships (Type 23, SRMH) and submarines (Trident). The current reassessment of Defence strategy and equipment requirements has brought about a lull in such activity. It is observed with some concern that some of these large facilities are being closed to effect budget savings and because the research requirements and funding will not sustain them. Despite assurances by DRA management that the capability will be retained it is possible that future design support requirements may not be available. This is not only due to loss of facilities but also of experienced staff to run them and conduct the tests. Closing these facilities reduces the chance of DRA attracting work external to MoD which might fund the maintenance of the facility and staff and sustain the capability for some future MoD requirements. Such work is more likely to go to other European establishments such as MARIN in Holland who are very vigorous in their approach to sustaining their facilities.

Several establishments within DRA have close links with international collaboration organisations. At Haslar the prime link is with the International Towing Tank Conference (ITTC) whose participants are all the ship test and research organisations world wide. This is a valuable source of interchange in test techniques and research on ship hydrodynamic performance. It is important to maintain an ability to contribute to such an international body if the exchange is to be retained.

The establishments which now constitute the DRA have a long history of providing a variety of services other than research to the Armed Forces, other MoD areas and other governmental departments. In times of conflict and other crises, such assistance, carried out extremely rapidly, has proved on many occasions to be of vital importance. Often, the security that can be ensured within a government establishment has been a very helpful factor. Less spectacular, but still of great value has been work such as:

(a) assessments and advice regarding future technical possibilities or problems in fields of interest to various government departments, eg MoD, DTI, Department of the Environment, Department of Transport;

(b) assessment of specific proposals form candidate contractors for government (sometimes internationally collaborative) projects;

(c) advice or technical investigations into problems of operation of equipment by Armed Forces, airlines, etc;

(d) development of techniques to improve the life of existing equipment, extend its operational capability, or improve safety levels.

Several important points can be made in regard to all these non-research services. First, the capability for providing them is founded on the expertise which government establishment staff develop and sustain by carrying out research work of an advanced and therefore demanding nature. Research is thus the bedrock from which these services can spring. From government's point of view, such additional services constitute an additional valuable "product" stemming from the existence of a strong in-house research programme.

Secondly, the objectivity and independent stance of a government establishment is a valuable factor. The commercial interests found in the private sector—eg in the sales of particular items of equipment or services—are absent.

Thirdly, the fact that a government establishment is providing the services can facilitate judgements of priority; if a very urgent requirement for particular services arises, it is generally other work for government that is temporarily delayed.

Finally, it is far easy to make assessments of the value to government of these services. In some cases the monetary cost may be relatively small—eg a few days of a technical specialists's time—but the assessment or advice provided may be of far-reaching value in assisting decisions on government action or policy. Furthermore, work is done for a variety of government "customer" areas and some of it, requiring high security, is not widely known about in other government departments. In these circumstances, it is perhaps not surprising that there may be a tendency for the value of these services to be underestimated by Ministers and senior officials who move in and out of post relatively frequently.

Government should certainly continue to avail itself of the non-research services which technical specialists working in the DRA can provide. There is evidence available in internal documentation of establishments and government departments which should demonstrate, at least in qualitative terms, their wide-ranging value to government. In the provision of these services, however, it is important that the DRA should be seen by all concerned as "an agency of government", having the same objective and disinterested stance which its predecessor establishments had. A danger here is that some may see the possibility of a compromised stance, deriving from the emphasis laid by MoD on the idea that the DRA should compete for increasing areas of its work with industry (Paragraphs 6.11 and 6.12 of Reference 1).

In regard to the formal provisions for the supply of non-research services, the DRA Framework Document (1) is appropriately worded—see Paragraphs 2.1 and 2.2.

The question cloaks a major change in policy which is explicitly stated in the White Paper, ie that DRA/MoD have in effect *no* national interest in anything other than defence. Since MoD is the UK government's biggest spender of R&D funds and expenditure this change is a national disgrace especially in the context shown by the 4 sub items of Q.6, which shows how closely rapid advances in technology need to be linked into Defence procurement and strategy. MoD and DRA are advancing a scenario of national separation of these issues which seems to be more in tune with Government views of the middle of 1980s than the 1990s. Earlier programmes eg DCVD, which funded extramural research in UK industry and Universities played a major role in the development of strategy for, and the early seed-corn funding for, solid state devices research in the UK, and much more of the core expertise in thinking of advanced systems was funded via MoD extramural contracts. A hidden but *very important* side benefit of this was that via contract supervision by MoD staff the MoD research programme was kept closely involved with front line civil research, so the MoD-led contracts were postively encouraged to have a civil element. All this is in danger of being lost in a potentially introverted DRA, only focussed on MoD needs and in many cases unable to supply or recognise these needs, and ignoring the broader national interests.

2. THE DRA'S MANAGEMENT, INTERNAL AFFAIRS AND CORPORATE STRATEGY

2.1 *Will planned restructuring and rationalisation affect excellence, or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?*

Excellence has far more to do with establishing determination to be the world's best. Improved efficiency will lead to improved performance through better deployment of resources and higher morale in the best staff. Improvements of this nature, following restructuring, can be observed but continual change works against this. The planned restructuring is a reasonable response to the need to focus the efforts of the DRA on meeting the future needs of customers who will utilise the DRA's work. This is in sharp contrast to the attitude of the past, which still exists in parts of DRA, that the staff of the DRA should decide what to research, how much to spend and when to report the results—if ever.

The restructuring will continue to the DRA meeting its new financial challenges. The main problem here is whether the DRA can remain viable financially under trading fund rules while the defence budget is declining. If it is forced to close too many "expensive" facilities, for example, it will lose necessary expertise which could lead to a spiral of decline. The Chief Executive is only too well aware of this and will no doubt make his view plain! Also, the DRA is now tending to favour staff with entrepreneurial skills, particularly at middle and senior levels, rather than research excellence *per se.* This is understandable but will need watching if the DRA's reputation for research quality is not to suffer.

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting-up of the agency?*

The rationalisation of the DRA is generally thought to be long overdue as it must learn to move with the times. Much of the current "churn" is due to inadequate initial planning. The current "rationalisation" is in some cases shorthand for radical cuts which, if done rapidly and well, could provide a sound basis for progress.

A view has been expressed that some changes have been too fast, both for the DRA itself and for the customers in the MoD. Confusion and loss of morale among DRA staff is present with a real danger of damaging the DRA's medium term research capability. Nevertheless, it is recognised that once rationalisation measures are agreed they should be implemented as quickly as possible if momentum for change is not to be lost, perpetrating a semi-permanent and inefficient half-way house.

2.3 *What are the implications of the new regimes's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?*

If the DRA is to succeed it should have complete freedom to set salary levels and to recruit and retain specialist staff. A perceived difficulty is the DRA's lack of clarity of role since commercial practices cannot be propagated in a non or semi-commercial environment. The DRA must be positive over its future and confident that its areas of expertise will not diminish if it is to continue recruiting scientists and engineers of the highest calibre. Experience with the DRA recruitment methods suggests that it is highly centralised and bureaucratic. The best recruit for a research group is not always selected because of the remoteness of the central control from the scientific group that needs the personnel. It is hoped that a vigorous and interesting research programme will enable the DRA to attract high quality recruits and that employment terms may enable non-contributory staff to be shed. Unfortunately some of the staff reduction policies of the '80's resulted in the loss of some of the most experienced staff who were then not available to train a younger generation. Further comments on the subject of shedding staff cannot be made without knowing the redundancy cost accounting rules.

2.4 *Pathfinder is the DRA's programme to allow private companies to gain access to research at a much earlier stage and to contribute ideas which align with their in-company, possibly civil, research programmes. The projected advantages of Pathfinder include more value for money by prevention of duplication of research and improving take-up of promising ideas, and providing companies with the earliest opportunity to develop their ideas thus improving their wealth-creating potential. Is the programme worthwhile? If so, does it need refunding and how can it be improved?*

The programme is worthwhile if it follows its ideas as stated in the question but it has to be left for at least two years or until the first full process has run its course before a judgement can be made. The original programme needed refining and its getting better and showing signs of continuing to improve. Also, if the programme is to succeed and be worthwhile, it is necessary for DRA to present its research projects and research results openly otherwise it can have the counterproductive effect of actually stifling civilian research.

Despite initiatives like "Pathfinder" a view has been expressed that the DRA should continue to concentrate on its defence job and on communications with the expected defence market, contractors and sub-contractors. Defence contractors all have some civil interests which they should be able to feed from their defence work.

2.5 *How does the DRA identify future defence needs, and is its method of identifying such needs properly thought out?*

It is now difficult for the DRA to function in this way. It is the MoD's responsibility (together with the FCO) to identify future defence needs. Concepts staff and MoD specify the military function required whilst the DRA advises on how current and future requirements may be satisfied, not the other way round.

3. The DRA's Relations with Industry, Europe and the Wider World

3.1 *Is enough being done to link the DRA's defence-orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?*

There is obviously benefit in linking civil and military research programmes where possible but defence research objectives should be set to meet defence requirements. If civil objectives can also be set, with or without additional funding, then that is good but, often, expenditure on civil spin-off involves too much speculation and cannot be recommended. Commercial exploitation can only be done to a degree, it should not be forced.

A decline in the link between defence research and civil research has been noted. Under the present economic conditions and defence needs there is therefore a need and appropriateness in diversifying defence research towards the civil sector. The transfer of defence technology to civil applications does not have an outstanding track record but a much better method is to transfer people. This is, in fact, happening as the result of the reduction of the UK defence industries. This may be good for the civil sector but is an abandonment of established market positions in defence exports.

The contrary view to the above is that not enough is being done to exploit commercially defence research findings. The DRA should be driven as a major national resource and not solely as a captive MoD group. Civil spin-off is good but not enough. The prosperity of the UK should be a major focus of the DRA management.

Much more should be done in the UK to sustain the competitive position of the UK aeronautical technology base. The DRA is well-placed to make a continuing and substantial contribution, and its staff are experienced in working to maximise the benefit to both military and civil aeronautics of the resources made available by government departments for research. Unfortunately both MoD and DTI have reduced their funding of aeronautical research in recent years and until there is some improvement in this situation the DRA's scope for contributing will remain limited. In this context, it is relevant to note that the House of Commons Trade and Industry Select Committee has recently expressed strong disappointment at the response of the Government to the "National Strategic Technology Plan for Aeronautics", put forward in 1993 by the DTI Aviation Committee.

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

Conditions necessary for the successful transfer of technology from the defence to the civil sector include:

a matching requirement and a market that can be both accessed and fulfilled;

trust, co-operation and regular contact, both formal and informal, between the DRA and industry;

clarity of policy which is lacking at present;

joint R&D programmes;

re-orientation of the DRA thinking to civil needs;

a "Technology Applications Advice Group" or some such with total commitment from the DRA management;

improved intellectual property arrangements with an imaginative approach to licensing and the transfer of IPR to industry;

staff transfer between the two sectors;

consideration of the commercial potential when formulating initial programmes;

continuity of background R&D at the DRA;

a record of sales success to defence customers;

early visibility of developments in defence technology;

ability to influence the DRA programme and priorities to work co-operatively with industry to ensure timely developments relevant to civil applications.

3.3 *How does the DRA connect to the Technology Foresight exercise being conducted by the OST?*

Through a revised Defence Science Advisory Committee structure acting, as part of its remit, through the Chief Scientific Adviser, to the OST Foresight Steering Committee on defence matters. Individual staff members of the DRA could provide useful input in areas to be covered by expert panels. This input should be sought in the same way as that of industry.

3.4 *How effective are the DRA's links with the DTI, and is there too little DRA involvement in the DTI's LINK scheme?*

The DRA involvement in LINK is very small. Historically the DRA money is viewed by the Treasury as Government money (MoD). Now that the DRA is operating as a trading fund it should be regarded as an industrial partner for the purpose of the LINK rules, so long as it constitutes less than 25 per cent of the programme budget. In the national interest there is a need for policy co-ordination in this area.

3.5 *Has the DRA effectively filled the void left by the demise of Defence Technology Enterprises, and is the DRA any more likely to succeed where DTE failed?*

It is not thought that DRA would fill the void, if any, left by DTE. The DRA cannot be all things to all men. It is more likely that good DRA scientists will do highly worthwhile research which will remain ineffectively exploited since no good, efficient, explicit, exploitation mechanisms have been identified in advance.

3.6 *What is to be the DRA's role in the issues of conversion and diversification in the defence industry as a whole?*

The DRA'a role is to provide MoD with high quality independent advice, otherwise MoD will go elsewhere. It is unlikely to have a major role in the issues of conversion and diversification in the defence industry. The DRA could help companies to restructure themselves to exploit military technology but, as presently structured, is unlike to do so effectively. MoD procurement policy will have more direct effects.

3.7 *How should it relate to the part of industry which is not concerned with defence and how much should it focus on dual-use research?*

Whilst the DRA should focus on defence first and foremost, making the results of its non-classified research work widely available to UK industry, it should be completely free to undertake research for any customer subject only to constraints of national security and commercial confidentiality. It should be judged by the value of the income so generated over several years. It should be active and flourishing as the middleman or the linking organisation between the conservativeness of the MoD and the general apathy of some sectors of industry towards manufacturing products from highly innovative research. Dual use increases market potential and could be a powerful incentive if used effectively. Dual use is vital and the DRA should help to lead in areas where it is expert although dual-use research should be a by-product and not an end in itself.

In the aeronautical field, much of the basic technology has dual-use potential; ie it is applicable in both military and civil aircraft and equipment. Such a situation calls for very close co-operation between MoD and DTI to maximise the overall effectiveness of the available government investment in research. There is scope for considerable improvement in the interaction between these departments, especially at the top level where the thinking tends to be "compartmentalised" under the pressures of general financial stringency. For example, MoD needs to take more account of the long-term likely effects of procurement policies on the future of UK industry in the civil as well as military product areas. In such respects, both the USA and other European nations behave in a more coherent way in developing both research and government procurement strategies.

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

Future competition is intended, albeit via a gradual opening up. Some industrial leaders are suspicious of the levelness of the playing field whilst on the other hand, the DRA is concerned that loss of certain work—in quality or quantity of both—could make its continued viability precarious. A major issue for industry is procurement policy. In some MoD/DRA thinking there is the illusion that industry would be "happy" to be funded to do research, with no potential procurement. In reality, if research and prototype development is not followed by orders then all the "leverage" of R&D is wasted.

Current MoD policy included that "... during the DRA's first three years as a trading fund [a key objective] will be to introduce significantly more competition between the DRA and other suppliers for MoD work" (Paragraph 6.11, Reference 1). There are dangers in this. If the DRA, industry and other institutions are driven into commercially adversarial positions, this could undermine the mutual trust and confidence on scientific and technological matters which existed for very many years to the setting up of the DRA. The "closeness" has been a factor of importance in enabling the UK to maintain a reasonably competitive technology base, despite the limited total funding available. It is much more important to encourage collaboration, and the exchange of ideas and information, between the DRA, industry and other relevant institutions, than to maximise competition.

Even in a purely MoD context, it is by no means clear that a heavy emphasis on competition between DRA and industry is desirable. In the past, there have been many instances where it has been greatly to MoD's benefit that defence equipment contractors have perceived the government establishments as friends rather than commercial adversaries. Almost by definition, most frontline military equipment is near the current limits of technology while it is being developed, and technical problems often arise. In such circumstances it is very much in the national interest that specialist technical knowledge should be pooled and deployed in aid of surmounting the development problems encountered on the project. The predecessor research establishments of the DRA have often been taken deeply into the confidence of contractors in these situations, and the excess of many defence projects owes much to help given by establishment experts. A more adversarial situation in regard to the "know-how" possessed by industrial firms on the one hand, and DRA on the other, engendered by considerations of the competitive strength of each in relation to future tenders to MoD for research and other services, could thus weaken or even destroy a mutually supportive mechanism that has been of great benefit to MoD, albeit one which is very difficult to quantify, in the past.

There is considerable scope for both conflict of interest and unfair competition with private industry but these issues will have to be sorted as they arise. The importation of ex-industrial commercial people will help greatly.

3.9 *What kind of relationship exists with the EC Framework Programme and other European (including non-EC) programmes, such as EUCLID and EUREKA?*

The DRA is active and well placed to lead UK research consortia in Europe. Such activity should be encouraged and expanded. In the UK context, by LINK rules DRA funds count as Government funds; thus industry is discouraged from having DRA as a contact. This is not the case in the EC.

3.10 *Does the DRA seek European collaboration as a matter of course?*

The DRA does seek European collaboration. Some sections of the DRA are thought to be somewhat ambiguous in their attitude towards EC contracts as evidenced by withdrawal because of lack of time or interest—to the surprise of their potential European partners.

The DRA is required to place a progressively larger proportion of its funding into extramural programmes. Many of these will be by competition of one form or another. It is understood that the rules on competition will make it very difficult to exclude continental organisations from bidding and sometimes winning such contracts. Many such continental companies and organisations bidding are likely to be wholly or partly state-owned and subsidised. It is questionable whether this likely development is acknowledged and acceptable.

3.11 *Is there in other countries anything relating to the management of defence research from which the United Kingdom could learn?*

A valuable aspect of a strong UK defence industry is that the UK Services have the choice of the most advanced equipment available anywhere in the world. At present, however, the MoD has no responsibility whatsoever for wealth creation or for the health of the UK defence industry. This "policy" of the UK government contrasts starkly with the policies of France and the USA (in particular) where defence exports are recognised as extremely important and government and industry work together in a much more effective way than in the UK. Under the current mounting financial pressures, it is likely that the MoD expenditure on defence R&D will be considerably eroded so that, before long, the MoD will be purchasing an ever-increasing proportion of its equipment from abroad—using currency earned by the civil sector!

What is required is that the Treasury recognise the above and:—

(a) authorise MoD to have a stable, long-term budget for the procurement and evaluation of UK-built technology demonstrators, the level of this budget possibly being coupled to the annual level of defence exports.

(b) to recognise that many of these demonstrators would be put into production for export rather than for the UK Services.

(c) enabling MoD to protect its procurement budget so that there is a stable home market—an essential pre-requisite before the UK defence industry can be expected to invest significant Private Venture funds.

Other nations have also encouraged a mutually supportive stance between their national research establishments and industry, and show every sign of continuing to do so. Senior individuals have indicated that they regard this as the most effective way of working, and have been surprised to learn of the emphasis on competition that has been adopted by MoD in setting up the DRA.

The present version of the DRA Framework Document (1) provides for co-operation with industry (Paragraphs 7.3 and 7.4) and this should be encouraged.

Appendix 1

Comments on the trading fund status of the DRA

The trading fund status of the DRA is coupled with a formal, quasi-contractural, "customer-supplier" relationship with the MoD. Although, because of the Crown Body status of both MoD and DRA, and the common ownership of their assets, it is not possible for legally binding contracts to exist between them, it is stated in the DRA Framework Document,(1)* paragraph 6.10, that business "...... terms and conditions will be interpreted in accordance with the normal principles of English Law as though a contract existed". In other words, work done by DRA for MoD will for all practical purposes be on a contract basis.

There are positive and negative aspects for DRA of the trading fund status, the "customer-supplier" relationship and the financial requirements imposed by MoD. On the positive side, a trading fund provides greater financial flexibility than the parlimentary vote system. The negative aspects are (a) the administrative burden of operating the "contractural" relationship, (b) the potential danger to longer-term, speculative research, and (c) the potential danger to continued operation of various major capital facilities operated by the DRA. Notes are given below on these positive and negative aspects.

GREATER FINANCIAL FLEXIBILITY

While the parliamentary vote system imposes a constraint on the planning of income and expenditure profiles with the object of producing a balance at the end of each financial year (or a near-balance, given the limited flexibility introduced in MoD during the 1980s), a trading fund confers flexibility approaching that enjoyed by businesses in the private sector. Importantly, a year-end surplus may in principle be retained in the business for later use, thus allowing more rational profiling of the procurement of material, equipment and services. A cautionary note should, however, be sounded. Reference(1) states (Paragraph 4.8) that any "surplus will be retained in the business or appropriated to MoD votes or paid as dividends on Public Dividend Capital in proportions to be approved by the Secretary of State (for Defence) and Treasury Ministers". In times of financial stringency, therefore, the DRA might find itself put under considerable pressure to part with surpluses which it had intended to use for the development of its activities and facilities.

THE BURDEN OF OPERATING THE "CONTRACTURAL" RELATIONSHIP

It is fundamental that whenever an initially monolithic organisation is divided into parts, and these parts are then required to do business with each other in some formal manner, there arises a need to devote resources to managing the interface. The more extensive and complex the nature of the business, the greater are the resources required at the interface. A wide-ranging research programme is a complex matter, and there can be no doubt that the operation of a formal "customer-supplier" style of working has made heavy demands on highly-specialised human resources on both the DRA and the MoD sides of the interface. It would be no easy matter to attempt to establish whether, overall, there is any improvement in "efficiency" and cost-effectiveness of the research carried out for MoD, but with the high administrative overhead just described it must be doubtful; any such reckoning must of course take into account the extra effort involved on the MoD side of the interface.

POTENTIAL DANGER TO LONG TERM, SPECULATIVE RESEARCH

A potential danger in the new regime is that research having limited, often short-term, objectives will become favoured at the expense of longer-term, more speculative research where "customer requirements" are not so readily defined and quantified. Although research of the latter type is currently supported by MoD under the category "Strategic Research", the scale of this is quite limited and, in addition the new regime appears to allow little or no scope for the DRA to pursue any particular line of research purely on the basis of its own judgement. History shows that such "discretionary research" has often played a vital role in the past; there are many instances where a research team, backed by the judgement of its own director, has produced a major success despite scepticism or even downright opposition in the early stages from "customer" areas. Some such successes have been recognised by Queens Awards for Technological Innovation to various departments of the research establishment which now constitute the DRA.

The financial requirements under which the DRA now works contrast considerably with those generally applying to government research organisations in other countries. In the aerospace field, for example, there are seven national research establishments in Western Europe. Of these, the DRA is unique in being required to generate all its income from contracts (or quasi-contracts) covering specific items of work. The others typically receive a "base grant" of about 30 per cent of total income as an aid to stability and continuity, and to provide some scope for "private venture" work in advance of customer demand, Senior, very experienced individuals in both the USA and Europe have commented that they would regard total dependence on specific contracts as an unsound basis for running a major research organisation which aims to cover a wide spectrum of work including long-term speculative research.

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*Numbers of brackets denote References, listed at the end

It may be noted that the provision of a discretionary component of funding as outlined above is not fundamentally incompatible with the trading fund concept; it could be incorporated within it. Such a change would be beneficial to the DRA, and ultimately to military and civil "customer" areas.

Potential Danger to Facilities

The current financial regime under which the DRA operates also gives cause for concern regarding the future of important test facilities which are used for research and, often, also for development testing in support of projects.

ONERA—France
DLR—Germany
NLR—Netherlands
INTA—Spain
FFA—Sweden
CIRA—Italy
DRA—UK

Various such facilities have been built within the establishments which now constitute the DRA, as central national assets to serve both government and industry needs. Often, they are not commercially viable in the normal sense; even very large firms would not feel able to own them. While vital to the success of major aircraft, ship or weapons projects, their annual usage may fluctuate considerably according to research and project needs. The situation is similar in other countries; their large facilities being almost invariably found within major government establishments. In the aerospace field at least, they are usually used for civil as well as military research and projects. Charging rates to the national industry are usually favourable. In the USA for example (which might be regarded as the home of capitalism and the market economy) very favourable rates are charged by NASA to the US aircraft industry for non-government project work in its wind tunnels. Indeed, one of the published "Strategy Thrusts" of the NASA Aeronautics Programme is to "Develop, maintain and operate critical national facilities for aeronautical research and for support of industry, DOD and other NASA programmes".

In contrast, the financial requirements now placed upon the DRA may make it difficult to avoid closure of some major facilities if there are lean years in terms of demand in the immediate future. It should be emphasised that it is not the intention here to argue against the closure of outdated facilities whose usefulness has greatly declined; the facility situations should always be kept under review, and well-judged closure can be a valuable way of liberating resources for other use. But closure of facilities which are agreed by the technical community to have long-term importance should certainly not be forced by short-term or even medium-term financial considerations in the DRA. There should be financial mechanisms for maintaining the availability of selected facilities which are judged likely to be required for important projects or research work within, say, the next decade. It is regrettable that a listing of such facilites as "national assets" in the run-up to the vesting of the DRA, put forward by the research establishments which now make up the DRA, appears to have secured no such sympathetic response from MoD and DTI.

The comparisons with practice in other countries are also relevant to Question 3.11.

Examination of witnesses

Mr I B Bott, FEng, Consultant Engineer (formerly Director of Admiralty Research Establishment), Mr F W Armstrong, FEng, Technical Consultant, Power Plant Systems and Aerospace (formerly Director, Aerospace Vehicles at RAE Farnborough), and Professor J R James, FEng, School of Electrical Engineering and Science, Royal Military College of Science, called in and examined.

Chairman

446. May I welcome you. Would you like to introduce your team?

(*Mr Bott*) On my left is Mr F W Armstrong and on my right, Professor J R James.

447. We are grateful to you for the very full written evidence you have submitted. You have seen some questions we are likely to pose. I must say that we may well stray some way from those questions. In the nature of things, that very often happens. Let me start by asking the question which is, in fact, posed as the first one arising from your suggestion that in the longer term the change in the DRA's status might prove advantageous. Would you like to elaborate on that? What do you mean by "longer term"? What draws you to this conclusion?

(*Mr Bott*) My Lord Chairman, as to the "longer term", subject to there being stability in the trading fund arrangement and no further drastic reorganisations, I have in mind three to five years. On the benefits, they fall into two categories. One is the qualitative judgment as to how well the organisation is doing. The other is the quantitative judgment in terms of the money they are spending. On the latter, I would be totally unsurprised to find that there is a financial benefit; i.e. a reduction in the amount spent. On the qualitative front, this is indeed a very difficult and challenging question. I ask how long does it take to form a good judgment? The answer varies obviously in the area of endeavour but it can be ten to twenty years before the quality of the original work, the research and technology, is proved to have been good or not good. My feeling, on the basis of discussions with other Fellows of the Royal Academy, is that in terms of their output performance since the DRA was formed, it is probable that because of the incidence of the demands of marketing and reorganising and the inevitable disruption, the actual output has diminished in terms of the cost-effectiveness, if you like, of the total situation.

448. To what do you attribute that diminution?

(*Mr Bott*) I think in the first place, when you are embarking on radical changes of any organisation, and especially with the DRA, there has been in some areas a loss of morale; there has been redeployment of people away from what might be termed the more productive research and project support activity towards ensuring that the new organisation is set up effectively and is going to work. There has been a pressure on the finances; disruption; and the available talent has not been as fully deployed on the main role of the DRA as previously.

449. Of course, whenever there is a change in management structure, there is always a certain amount of consternation that research time is sacrificed for the cause of administration. Perhaps that is inevitably a perception, though if the change of management is correctly handled, the ultimate effect will be to focus more helpfully the research effort. Would you acknowledge that can be the case? Would you like to comment on whether this is the case in the DRA?

(*Mr Bott*) It is very hard to look into the future in this respect. It depends so much on the maintenance of high quality activity within the DRA. That means the retention of high quality staff and the recruitment of high quality staff. It is a very complex question. I do not think I can answer it in a black and white sense to your satisfaction.

450. We have heard a lot about concern for the increased accountability which is interpreted very often as increased bureaucracy and the fact that the industrial sector finds that communications with the Ministry of Defence now tend to be more complicated than they were in the past because of the role that the DRA has been given in many respects. Would you like to comment on that?

(*Mr Bott*) My comment is that it has always been a fairly complex matter looking into the Ministry of Defence from the outside. Certainly, the changes that have been introduced with the DRA are highly significant in terms of their having to win or aspire to win research work. One of the fundamental effects of this on the important interplay between industry particulary and the DRA is that it is not quite as clear that the maintenance of an independent comment on the placing of contracts and so on is as strong as it was before the DRA was created. I say this because I am aware of problems that are seen from the industrial point of view rather than problems that I have seen myself.

451. There has always been considerable interchange between Ministry of Defence staff and DRA and in some senses this must help procurement and help the DRA to understand the requirements of the Ministry of Defence. In so far as the DRA might one day be able to have complete freedom to set salary levels, this would presumably make the interchange rather harder if the MoD was sticking to normal public rates of remuneration. Would you like to comment on that as a problem? Do you think it desirable that DRA should move towards being able to manage its own affairs in this way?

(*Mr Bott*) I find there is a conflict here. I would certainly, looking at it through DRA's eyes, wish to have the freedom to pay according to the needs of DRA. Looking at it from the exchange of staff between the Procurement Executive, say, and the DRA, I think difficulties will inevitably arise, and probably have arisen already—one of the solutions to which is to offer an individual promotion or move him from one area to the other. I am not saying it is an insuperable problem but I do believe it is a problem. It is an important problem because, as your Committee is well aware, the interflow of people between one activity and another, and indeed between industry and academia, is a very healthy thing to achieve.

Lord Trefgarne

452. In paragraph 1.4 of your submission you talk about the anomaly as you see it of most strategic and applied research funds being dispensed either by the Chief Scientific Adviser, the Deputy Chief of Defence Staff (Systems), or the DCDS(S), whereas in your view it might be better overseen by the Chief of Defence Procurement. Could you say a little more about that?

(*Mr Bott*) The strategic research element, which is the responsibility of the CSA, is one that is well placed and well managed. The applied research is the area in which the difficulty arises. The Deputy Chief of Defence Staff (Systems) has the overall responsibility for determining the applied research programmes. His staff are in general serving officers on two years tours typically. They are usually people of high quality, brought up to be leaders of men and drivers of their vehicles, the ships or whatever, not, in my judgement, best placed to make decisions on the sometimes subtle interplay between research programmes and their eventually fruiting into products and equipment. This is what lies behind the point that has been made in the paper that the Royal Academy presented to you. It may be that there are more than one or two possibilities on how to arrange things differently. I think and hope that the one posed here is one which you will find a reasonable alternative.

453. That was really going to be my follow-up question, whether if there are the shortcomings that Mr Bott has pointed to with the present arrangements, he has any confidence that CDP would do any better?

(*Mr Bott*) I feel almost inclined to pass on that question.

Chairman

454. That is no doubt why Lord Trefgarne put it to you!

(*Mr Bott*) Let me say that I have a view of the interplay between MoD, CDP's organisation and the Defence Research Agency which is very much an interplay. If you do not go out and talk and listen to the three sides, you will not reach the right conclusion. What I would look to in DRA is a receptiveness. I would expect them to play a significant part in formulating and setting up for perhaps adjudication by others, but certainly setting up a proposed applied research programme. I say this in the knowledge that many of those scientists and engineers in the Procurement Executive have actually spent at least part of their careers in the research environment. They have carried with them an understanding of the research environment to which they have added an understanding of the project environment. By rubbing shoulders with the services, they have quite a good understanding of the operational needs and how they are best met. It is a cultural thing. There has to be this interplay between all parties.

Lord Trefgarne

455. It is fair to say successive Chiefs of Defence (Procurement) never had much of a research background except, I suppose, the first one.

(*Mr Bott*) Yes, Sir Clifford Cornford.[2]

Chairman

456. On this subject, are you not a little concerned that if strategic research was to move towards the CDP we would be running into the risk of short-termism?

(*Mr Bott*) I think I said at the outset that I except strategic research from those comments completely. Strategic research is a very different animal requiring a different approach and the highest quality scientists. It is a very creative activity. I am not diminishing the activity of those who do applied research or their quality but it is the creative end. Whilst it is not entirely blue sky, it has to depend a lot more on the initiatives of local high quality scientist and engineers than does the applied research. That is the crucial difference. I am content that the strategic research should rest with CSA and be protected at about 10 per cent, or whatever it is, which I think is a very reasonable figure.

Baroness Platt of Writtle

457. Actually there are two questions beginning to merge together, questions 4 and 6.[3] You talk about agreed margins for private venture exploratory work at about 10 per cent and the importance of strategic research. You are also, on the other hand, critical of the MoD's lack of interest in the non-defence side of the work they are doing. I wonder what you would offer to enable them to carry out this kind of work without sacrificing principles of clear accountability as things stand at the moment?

(*Mr Bott*) There is a great difficulty here. As things stand at present, one can take a black and white view and say that due to the Parliamentary voting system, it is certainly not the responsibility of MoD to nourish any civil potential. In my experience, that has not actually been what has happened. I could quote, for example, the work that was done in Malvern many years ago when I was head of an electronics group there on weather radar. This was a subject that was given a very firm thumbs down by all three services but, nevertheless, it went on—the Deputy Defence Chief was not in charge—and that is why we have better weather forecasting to support the movements of the Royal Air Force aircraft, and radar weather maps on your television. That is an example where, if you like, there was an enlightened

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[2] Mr Bott has since informed the Clerk to the Committee that, on reflection, he considers that "never" is too strong a statement to respond with "yes".

[3] The questions referred to are as follows: 4. You are critical (pp 9 and 15) of MoD's supposed lack of interest in the non-military science base. What proposals can you offer that would enable DRA to serve a wider purpose without sacrificing principles of clear accountability for funds voted for defence purposes? 6. Para. 13 argues that for DRA to be able to develop elements of an independent strategy, it will be necessary for MoD prices to include"agreed margins for private venture exploratory work". How might such a system work? Could it be made compatible with the financial disciplines and customer orientation that lie behind the transition to Agency and Trading Fund status?

[Baroness Platt of Writtle *contd.*]

conjunction between the civil and the military. There are other examples. I hope that this is not defeating of the vote system in the sense that every Department of State, I assume, has an overriding responsibility to take an interest in the well-being of the nation as a whole. If I were to refer to one of the comments made in the paper of the Royal Academy as submitted, it mentioned an organisation with the initials CVD—Component Valve and Devices. It was the practice when I was researching twenty years ago that when there was a military need for a new device and it was funded, if in fact there was also a potential civil outlet, then that device received a higher priority in the funding. I hope that that was not defeating the vote system but there has always to my knowledge been a great willingness to talk and discuss on an ongoing basis with those in industry, so that one can keep abreast of what the industrial interests and needs are. My concern about the DRA is in part that the position of trust I enjoyed in the past will be damaged by the element of competition that has been brought into it. If I may elaborate a little on the mechanisms of getting close to an understanding of what is going on in industry, this is not something on which the DRA or the research establishments come with great nuggets to give to industry; they talk. They talk as one professional to another. They talk over a period of months and years. They participate in organising conferences for the IEE or whatever. They share in supporting their profession. One part of this is to build up confidence. At the end you never know quite where the particular thoughts came from but you grow together. Anything that nourishes the continuation of that sort of interplay is, I think, very healthy, and the converse.

458. Would you think that if the DRA had some sort of responsibility to the DTI or the Government had more than overall responsibility, you would get more of the sort of culture you are talking about in action?

(*Mr Bott*) It could make it easier but it requires the blessing of management and a certain amount of enabling in terms of the thoughts you are deploying.

459. What about if the DRA or MoD or together take part in the Technology Foresight initiative that is going to happen over the coming years? Do you think that would help in the various working parties?

(*Mr Bott*) I do not believe it could do other than help. I am not sufficiently close to it to know whether how worthwhile the total exercise is. I plead ignorance on that. I do not know if my colleagues know.

(*Mr Armstrong*) I suspect that with the emphasis on improved coordination which is in the papers as I have seen, and again I must stress that I am not really close to this—

460. It has not arrived yet, has it? It is still in the planning process.

(*Mr Armstrong*) That is right but there have been a few papers issued describing the general concepts. I have a feeling that as long as public resources for supporting science and advanced technology remain very short, then there will be the danger that in cases where the customer demand for new technology or development is not too clear—and I think a good example is the weather radar which Mr Bott mentioned a few minutes ago—the support for these things might fall down the cracks between government departments. You have the different departments; although it is intended that they will be liaising better and be coordinated better and there will be a suitable structure of committees and so forth, individual departments will still essentially be compartmentalised in the financial support that they can give and there will be a tendency to say, "We cannot afford it and it is not our baby". I think there is a danger there unless there is a very fundamental shift towards the idea of supporting UK Ltd. technologically in a long term way, as indeed occurs in other countries like France and the USA.

Lord Howie of Troon

461. Mr Bott, in your evidence in paragraph 1.5 you talk about an inherent conflict of interest in the DRA in dealing with the merits of some R&D proposals. Arising from that, I would like to ask you: Are you dissatisfied with the DRA's arrangements for overcoming these potential conflicts of interest? If you are dissatisfied, have you any proposals that might help to remove this worry?

(*Mr Bott*) First, I am not fully conversant with the detailed arrangements. The comment derives from the point that was raised earlier about DRA having to comment and advise MoD on contracts for projects on which the DRA itself may be bidding. I am always interested in studying any new organisation to see whether it runs counter to the grain of human nature, if I may put it that way. When you find that the financial pressures are heavily on an organisation and they are therefore justifiably very keen to win contracts, I believe it is almost unfair to ask them to consider their own work dispassionately in competition with others. As far as solutions are concerned, without actually commenting on the DRA and the way it is set up in the sense that it is competing for business, I have nothing to offer. I ask my colleagues if they have anything to say. I am sorry that I have nothing to offer on the practical solutions, other than overcoming the fundamental problem of competition.

462. In fact, I think you expect this to work fairly badly in some way.

(*Mr Bott*) We live in a very imperfect world. I am sure every effort will be made to make it work but I believe there is an inherent difficulty.

463. It is very difficult to set your own views on the merits of your own proposals to one side, while you are dealing with the inferior proposal of somebody else?

(*Mr Bott*) You express it beautifully, my Lord.

Chairman

464. Is it not even more fundamental than that? If there is a perception in industry that there is a risk of the Chinese wall crumbling, that perception in itself will prevent the free flow of information between industry and the DRA?

(*Mr Bott*) My Lord Chairman, had you not made that point, I would have made it. I had it in my mind to make it but did not. It is absolutely true that the

[Chairman *contd.*]

perception is very important. My belief at the moment is the perception is that the Chinese walls are not going to be very effective. That is my perception of industry's view. You may, of course, get a different view or confirmation of that view from industry itself.

Lord Howie of Troon] You are saying, in fact, regardless of the strength of the Chinese wall, as you call it, the structure, the implementation by the people, is the really the important bit, and the perception of that implementation?

Baroness Hilton of Eggardon

465. Even if the Chinese wall was effective, you are still setting up DRA as a competitor which is bound to work against trust, partnership and collaboration with industry, even if you have got that Chinese wall. You are still in a competitor situation and therefore you are not going to have partnerships with industry.

(*Mr Bott*) There is another way of looking at this. It is my understanding that the DRA has been set up in an optimal way to increase the competitive pressures within the United Kingdom. If that is true, then it is highly likely that what has been set up is suboptimal in respect of our main competitors who come from abroad.

Chairman

466. Would you like to elaborate on that?

(*Mr Bott*) Suboptimal in the sense that it does not set up the best defence/government combination to deal with foreign competition.

467. What would you, therefore, recommend to this Committee be changed?

(*Mr Bott*) I would like to see a situation in which those who are within the DRA are able to enjoy the full confidence of industry in the sense that they are not competitors, so that the processes I described earlier of talking and interaction can take place in an environment that goes with the grain of humanity, in the sense of avoiding competition. If that happens, then you have other benefits that have in the past been available in that through the placing of research and other contracts with industry there is a formative cohering effect on the United Kingdom industrial defence capability, which is reflected in a more coherent ability to beat off the opposition from abroad.

468. I think I understand you to say if we could bring our act together in this country we would compete more effectively?

(*Mr Bott*) Thank you.

Lord Howie of Troon

469. Does this not make it extremely difficult for DRA to compete inside the United Kingdom?

(*Mr Bott*) Yes.

Baroness Hilton of Eggardon] It makes it impossible.

470. You would prefer this to be possible? That is the point I am driving at.

(*Mr Bott*) I personally would but I am not trying to change the world in this short discussion. I think I have a legitimate point of view which I am grateful for the opportunity to present.

Chairman

471. I think you made some fairly fundamental suggestions as to how the DRA needs to be restructured if this cooperation and coherence you refer to within the United Kingdom is to be achieved and which at the moment is inhibited by the DRA being an active player. What you are really asking—and there is a questionnaire about this—is that DRA evolves in such a way that it is no longer perceived to be an active player; it takes a step back and assumes the more traditional role of an adviser to the Ministry of Defence with a research capacity?

(*Mr Bott*) Yes, my Lord.

Earl of Dundonald

472. How do you maintain the efficiency or the drive towards increased efficiency in the DRA if you take it out of the marketplace completely in terms of competition? Without any form of competition, are you not going to get the staff and people within the DRA sitting back and saying, "We are not in a competitive situation; therefore, we do not have to try so hard"? Therefore perhaps they are not going to do as much.

(*Mr Bott*) This is a question of leadership and management and financing. There is a lot of goodwill, and I do not recognise this tendency to inefficiency that my Lord has just enunciated.

473. I was not recognising it or not; I was simply asking the question as to whether you thought there would be a drift away from efficiency if you took the DRA out of a form of competition with industry within the United Kingdom. It was not a question; it was a statement.

(*Mr Bott*) I am sorry, my Lord, to misunderstand you. I repeat; it is a question of management, constant vigilance and deciding what it is you are going to use as your criteria for success in your research organisation, recognising that it does take a long time to establish the outcome. I am sure the concept I referred to earlier is well able to match and continue given, as I say, the leadership thrust, to be effective and efficient and not to fritter away either time or resources. When I mentioned the control of resources, I am not in any sense ruling out the full discipline structured debate on where, given a package of resources and no more, the research effort should go. There are still very legitimate pressures but they are not quite of the same nature and they do not involve this conflict with industry.

(*Mr Armstrong*) In terms of mechanisms in regard to financial efficiency one can, of course, do audits of the performance of an organisation which is not actually in direct competition with another set of organisations. You do not actually have to have them competing all the time. Some years ago when I was at RAE we became involved in doing some comparisons to answer questions raised by the DTI regarding the cost of doing research in aeronautics. We went into this in some depth on a couple of examples. It was a very interesting process and took quite a time. Our own accounting system, I thought

[Earl of Dundonald *contd.*]

at the time, was fairly crude and simple. I was interested to find the corresponding industry accounting systems were also crude and simple but in a different way. In fact, we found in the end that we were within a few per cent of the industrial costs in that area. That was a heartening answer, for what it was worth. Of course, as Mr Bott says, the whole issue is much wider than this. It is fair to say that most people who have worked in the national research establishments have an experience of well- motivated staffs who are really very self-driving on the whole and are aiming, certainly in my experience, to support the broad national interest. This is one of the reasons why industry in the past pre-DRA has been so willing to trust the research establishment people. They have been seen as disinterested in terms of commercial adversarial positions. They have been trying to work in the national interest. I think one can achieve that again quite readily. One sees it also in other countries. I have moved around quite a bit in mainland Europe in recent years. One sees the same sort of thing there.

(*Professor James*) We are searching for how we might keep the DRA fresh, whilst not in competition. It has always seemed to me the way they are actually funded, their terms, are central to this—certainly colleagues I know still feel very much part of the MoD because some of them have got short term contracts—and that maybe they can go back into the MoD. A way of perhaps keeping the profession independent might well be to finance them in a more independent way.

Lord Renwick

474. Following on from the general course of the evidence that has been given to us, it does seem there has been some lessening of that terribly important link between research in the defence field and research throughout the commercial industrial sector. That close link is vital to the Ministry of Defence for it to actually achieve the best service possible. Can you cite evidence of the diminution of these activities, these links?

(*Mr Bott*) It is difficult to cite specific examples since I am no longer directly involved. The effect flows from tighter money, a tendency to introversion and a nervousness of disclosing information which might be needed to support the activities of the DRA itself. I am sorry I cannot answer your question. I will ask my colleagues.

475. May I follow that? As I understand it, what you are saying is that there has to be a change in the structure of DRA to bring back the confidence between the private sector and the DRA so that the country's general research can be more competitive in world terms. We have had evidence today that there should be perhaps a research centre of excellence. Can you see that the DRA could become that?

(*Mr Bott*) Yes, my Lord, and not necessarily across the board because the centres of excellence are wholly dependent on having people of excellence. First of all, you have to find out where your people of excellence are and really work from there as a practical way of moving forward. You then ask: Centre of excellence in what? The Ministry has to decide where it wants or needs or can have centres of excellence, a phrase which, incidentally, has been around in my vocabulary for many years. Subject to that practical comment on making sure before you create it that you have the people who can sustain it, the answer is yes.

Lord Redesdale

476. Could I take the argument somewhat away from the line we are following really to look at the research facilities of the DRA at the moment? I was wondering if it was possible for you to give any examples of where short term decisions have put major facilities at risk.

(*Mr Bott*) First of all, facilities are widespread and to replace them would cost many hundreds of millions of pounds. The No. 1 ship tank at Haslar has gone. I believe, though I am not certain, there may be question marks on some of the others. Micro antenna ranges, submarine and ship noise ranging facilities off the west coast of Scotland, space hardware and test chambers all come under the category where I believe they are being either questioned or are at risk. It does raise the very important question: What does one do about it? If the country deems that they are necessary, not next year but perhaps in five years' time or whatever, and that the cost of replacing them if they were let go would be great, then some means of funding their sustenance has to be found. Since it is such a long term, high capital investment, it may not be appropriate to charge that to a research budget, although all of them will be used by researchers.

Lord Howie of Troon

477. To what do you attribute that?

(*Mr Bott*) There may be others who would have more educated views than myself. That certainly needs to be at MoD level.

(*Mr Armstrong*) My own background is the aeronautics field. There we have major wind tunnels and a variety of other facilities but there are some very major wind tunnels. In the USA NASA has declared that one of the objectives of its aeronautical programmes for the next few years is—I will try to quote the words—"to revitalise the facilities of the establishments of NASA for the benefit of the US aircraft industry and the DOD". They have a budget within NASA which is specifically devoted towards not only maintaining those facilities in existence but upgrading them. It is fair to say that some of the NASA facilities needed upgrading. Some, of course, are in better shape. However, when you look at the usage of such facilities generally you see that it fluctuates quite a lot. The facilities like wind tunnels are often used for a mixture of both research work and for development of major projects, such as civil and military aircraft. The usage for projects tends to be very intensive when there are important projects under development. For example, if something like Tornado is going through the system, you get a lot of usage. On the other hand, there can be periods when the project demand is fairly low. A concern which we have is that in those low periods there is a danger that decisions can be taken in the DRA, for balance sheet

[Lord Howie of Troon *contd.*]

reasons, considering the next couple of years or so and that they will shut some of these things down. It is important to remember that they were put there as national facilities. In all the major aeronautical countries the big facilities are government-owned. Even the biggest firms could not really justify owning them. They are not commercial in an ordinary sense. It is difficult to support them on an ordinary balance sheet basis. Some of them have a high content of civil government money anyway, such as DTI contributions to building costs. It is very important they should be considered on a timescale like a decade, not the next couple of years' balance sheet.

478. If you shift these facilities out of the DRA budget and put them into the general MoD budget, would that not alarm some of the potential competitors, since the DRA is supposed to be becoming commercial?

(*Mr Armstrong*) Perhaps that is a possible consequence but, of course, the industry has been quite accustomed to seeing these facilities being available to it with government funding over the years.

479. Not in a competitive country?

(*Mr Armstrong*) No.[4]

Chairman

480. Could I refer to your answer to question 3.2 which referred to the successful transfer of technology? You gave us a most helpful and fairly comprehensive list of the conditions necessary for the successful transfer of technology in your written evidence. I wondered if you would like now to talk of the structures to implement this. Perhaps you would like to comment on examples which are in progress at the moment, like Pathfinder, and the Dual Use technology. Could you advise us as to how you would like to see this technology transferred?

(*Mr Bott*) To my certain knowledge, over the past thirty years this has been the subject of various initiatives. The most recent I am aware of is the Defence Technology Enterprises with their ferrets going round establishments. No one solution has, in my judgement, emerged as indicative of the path we take, except the remarks I made earlier about the working together in a cooperative way and a structured way through funding of work in industry, the contact between inter-mural, DRA staff and industrial colleagues. If you look at the benefit that industry has had in the defence field through systems such as Rapier and Thermal Imaging Common Modules and so on, which Lord Trefgarne knows about very well, that has been quite a significant benefit. I am not aware prior to DRA of the selfish retention of information of research results or technology within the then research establishments. I would point to one area that gives me great concern. That was, given that technology was known about within a company, it was not then used within that one company and made known to its civil areas; for example, GEC is well compartmentalised in terms of their defence and non-defence work. It was not always obvious to me that the information they had within the company already was being transferred within that company. Perhaps I have unfairly used GEC as an example there but this sort of thing does happen. It does require something on the industrial side as well to make use of the technology.

481. We have just heard from the CBI that industry finds it very hard to gather from the DRA what information they have. Would you like to comment on that?

(*Mr Bott*) I have no recent knowledge of that, although I would understand if it were true. I was talking about pre-DRA times.

482. Could I refer you now back to a further part of your written evidence? It is a fairly long answer you have given us to question 1.7 on the third page where you refer to a major change of policy which you suggest was stated in the White Paper. Is it really true that it is a major change of policy and that MoD has in effect no national interest in anything other than defence? It is a fairly fundamental point that Parliament enforces funding of departments for their brief. Do you believe the White Paper in fact expounded anything which was dramatically new?

(*Mr Bott*) I turn to my colleagues to answer this question.

(*Mr Armstrong*) I would offer the thought that this compartmentalisation, as I would call it, has become more severe as money has become tighter. That is an answer which says it is a matter of degree. I cannot comment on whether there has been a fundamental change. Probably if you examined all the papers you could satisfy yourself that really there has not been a policy change fundamentally because MoD has previously only been responsible for defence activity. Of course, at an earlier stage there were other Ministries which were broader than MoD. I can think of the Ministry of Aviation Supply, for example, years ago, where the remit there was to take care of aviation for defence and for civil purposes. There are possibly things like that one could refer to. But it is certainly true that as money has become tighter, departments, again going with the grain of human nature, as Mr Bott has said, have tended to say, "We have got to be very careful how we spend our money. We have to be able to defend it to our masters. We really cannot spend money by taking a wider view of anything. We have to work very much to our remit".

483. It seems ironic therefore you feel that the White Paper, the major theme of which was wealth creation, you believe in this particular aspect does just the opposite and points to a move away from wealth creation and more targeted funds, more towards defence.

(*Mr Armstrong*) You are talking about the White Paper, "Realising our Potential"?

484. Yes.

(*Mr Armstrong*) It seems to me that it says the right words and talks about coordination and structures of liaison and so forth but unless there is a political will to develop a long term technological strategy, to

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[4] The Royal Academy of Engineering has since stated to the Clerk of the Committee that in qualification of this answer, it is appropriate to state that industry is accustomed to making payments for using these national facilities for non-MoD projects, e.g. civil aircraft. The issue is their continued existence.

[Chairman *contd.*]

develop the strength of the nation across both military and civil fronts, then I do not think we will get very much out of it. There are limits to how much you can improve the efficiency of a system just by setting up better coordination. There is a lot of coordination now. The people in the MoD and DTI would say to you, for example, that on the research programmes in aeronautics they do collaborate closely. There may be the odd few per cent improvement still to be made but when you set that against the fact that the public funding support for aeronautic research in this country has fallen in real terms by no less than 50 per cent over a period of about six years, you have a tremendous problem there in terms of competing on the global scene where you have nations like the USA determined to continue to be preeminent in aerospace and nations like France and Germany wanting to come up more strongly. It is going to be very difficult for us long term to hang on to our market share if we do not put in the investment in research. I talk of aeronautics but I am sure it is also true more widely.

Lord Howie of Troon

485. The written evidence on that goes a little further than Mr Armstrong has gone. You describe the change as a national disgrace. That is a fairly firm comment. Do you stand by it?

(*Mr Bott*) Could you point me to that?

486. It is on page 9, the fourth line of the large paragraph.

(*Mr Bott*) I would not necessarily stand by the choice of words.

487. You mean somebody else wrote them?

(*Mr Bott*) It is one of those logical statements: If such and such is true, then— Already Mr Armstrong has shaded that by saying it is really a qualitative decision and it is a matter of degree. That is why I would depart slightly from the actual wording, without actually denying the source of what lay behind them.

Lord Trefgarne] I believe, my Lord Chairman, that these amusing asides do actually point to an important factor. The fact of the matter is, is it not, that as military aeronautical research, for example, has become more focused in recent years, very often directed towards specific programmes for the Ministry of Defence, the spin-offs available to the civil aircraft industry have become less and less. Where is the source of new ideas for the civil aircraft industry? There is not much blue sky research going on at British Aerospace. Some of the research facilities that we have which in the past have been largely involved in this work, like at Farnborough and elsewhere, are being closed down or reduced and maybe we ought to be considering just where the source of ideas for that industry is going to be.

Chairman

488. Would Mr Armstrong like to comment on that?

(*Mr Armstrong*) I do not think I can add very much more. In the aeronautical scene we have a very interesting and challenging situation. We are in the middle of a very great change in that funding for military aeronautics is going down, for production as well as research; orders are reducing. The industries, not only of our own country but of other countries, of course, are finding it harder to remain profitable. They have a problem in directing enough investment towards research; that is one matter. On the other hand, long term you can say that the civil aeronautics scene is a very encouraging one in terms of expansion. It is a more or less universal view in governments, in industry, in various authorities, airlines and so on, that long term we can see a continuing expansion in air transport at something like a rate of about 5 per cent per annum in seat miles flown. That means that over the next 15 years or so air transport will have doubled. It has been estimated that something like 17,000 airliners will need to be built in the next 20 years, about half of those to satisfy the increased demand and half of them to replace the ones that are wearing out. There is a very big future market there for aeronautical hardware, yet we are in this change from a military-based industry more towards a civil one. Economically there is a great battleground in the world on aeronautics. It is a major industry. The USA has seen a number of its industries disappear to the Far East and it is determined to hang on to aeronautics. It is making large investments in it. The NASA budget for aeronautical research for this year, for example, I do not think has been finally approved yet but the bid was for an increase of about 18 per cent. In other areas in the aeronautical world research budgets are being maintained or rising. If we go on reducing ours, we will be in trouble. Our successes of today are based on the research of the past 20 years. If we cut down, as we have done, we will not see the effects tomorrow but we will certainly see them long term. There is a real problem here.

489. That is a very interesting note on which we have ended, as we are running out of time. Thank you very much, Mr Bott, Mr Armstrong and Professor James. We are most grateful to you for your help today.

(*Mr Bott*) My Lord Chairman, may I, on behalf of the Royal Academy of Engineering—and many Fellows have in fact contributed to the paper that you originally received—thank you for your courtesy and interest. It has been a pleasure.

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DEFENCE RESEARCH AGENCY

PREVIOUSLY UNPUBLISHED
ORAL AND WRITTEN EVIDENCE

THURSDAY 17 MARCH 1994

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Redesdale, L.	

Memorandum from the Institution of Electrical Engineers

The Institution is pleased to respond to your request for a submission on the subject of the Defence Research Agency. The Institution represents 130,000 electrical, electronic, computing and manufacturing engineers employed in industry, higher education and the Government service. Within our membership are those who work for the Defence Research Agency, and those who interact with the DRA in the course of their business. The Institution recognises that the DRA is an important source of advice to MoD, and represents a major national research asset. The primary role of DRA has been, and should continue to be, the provision of technical advice to MoD across a broad range of defence needs, underpinned by technological research programmes. Continuity and expertise of staff is very important in this role, and although specific advice could often be obtained from industry when necessary, the continuity provided by DRA is a vital aspect of their work.

As market pressures force industrial research to concentrate on the shorter term, the longer term research programmes of DRA are of increasing significance. For the DRA resource to be effectively utilised improved technology transfer to the civil and military commercial sector is vital.

The changes brought about by the implementation of the Defence Research Agency status are still to be fully effective. Further evolutionary changes that are needed are:

- the trading procedure and the organisational environment which can be detrimental to innovative ideas need to be streamlined in order to stimulate novelty and flair in research programmes.
- the package management procedures need to be simplified in order that MoD customers and industrial suppliers have great interaction and visibility.
- the agreed rationalisation procedures, such as the closure of sites and the alignment of the intramural programme with the Pathfinder programme, should be implemented more rapidly.
- measures should be introduced, with the agreement of the MoD customer, which allow closer interaction between internal research programmes and those in the private sector.

Detailed responses to the specific questions posed by the Select Committee are given in the Appendix to this letter.

The Institution will be pleased to elaborate points made in this submission if so requested.

Yours Faithfully

Dr J C Williams
Secretary

APPENDIX

Submission by the Institution of Electrical Engineers to The House of Lords Select Committee on Science and Technology Sub-Committee II—Defence Research Agency

1. THE DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH THE MOD

1.1 *How Independent of the MoD is the DRA?*

MoD is the owner and chief customer of the DRA. Its role is to provide independent advice to MoD, which funds around 65 per cent of turnover. In this circumstance there is little independence, nor is it to be expected. MoD, as currently constituted, needs DRA for technical advice. In principle it could obtain this advice from other sources, but continuity would be difficult, and experts who are not linked with commercial suppliers are rare. Moreover, so far, Government has not been keen to see the DRA expand on the basis of third party contracts.

1.2 *Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

On balance, trading fund status should be a help. Customer/supplier relationships, technical competitiveness, detailed knowledge of the cost of deliverables, clear objectives and proper handling of capital investments are essential to good research. However even in industry, where production generates the flow of funds which indicates the long term success of research activities, demonstrating the financial viability of a research organisation is very difficult. Changing DRA's status to that of a trading fund must not be allowed to diminish the role of DRA by assessing its performance solely against possibly unattainable financial objectives—particularly as there is no production directly following from the research programmes to provide a yardstick for success or to generate funds for future research.

Given the dominant relationship with the MoD as both owner and customer, some trading fund bureaucracy is excessive. In particular, there may be over-planning of research programmes at working level. High quality research needs thinking time which is not easily accommodated, either in DRA or industry, within the context of rigid accountancy procedures. An inflexible accountability could lead to an emphasis on short term research rather than high quality long term programmes.

1.3 *How does the DRA's status affect its research strategy?*

DRA will not be able to develop its own research strategy while it has no funds which it can allocate to speculative research programmes of its own choosing. Even category 5 basic research is decided by the MoD customer. In industry some companies include a research levy in their price structure, or use other methods, to provide a central fund for basic/strategic research. In contrast DRA is not allowed to introduce a levy on the prices it charges the MoD and has no other means of raising independent funds for research.

1.4 *How has the MoD's system of research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading Fund Status?*

The package management system is still evolving and the greater visibility should be beneficial for efficiency and effectiveness. Internally, the system is sometimes seen to inhibit direct customer contact, and externally, it has yet to win the confidence of industry. However, the system, or something similar, seems essential for continuity and efficient customer/contractor relationships with MoD customers who in many cases are non-technical and on short term postings.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

Competition between DRA and industry, inherent in trading status, may inhibit technology transfer and stimulate duplication in other research laboratories, unless special additional measures to counter these trends are taken. However there is a growing realisation in DRA and industry that in many areas there is little direct competition as the role and motivation of the two sectors is quite different.

1.6 *How is the process of formulating a strategy for the DRA being affected by the new thinking about defence and foreign policy following the end of the Cold War?*

Meeting changing requirements with the best affordable technology is at the heart of the DRA's remit. The new status of the DRA, notably in respect of customer driven programming and greater financial and staffing flexibility, will increase responsiveness to new military environments. For quick reaction at a time of rapidly changing requirements DRA needs to continually appraise the possibilities of currently available commercial equipment.

The more fundamental question is that of the MoD's strategy, which at present seems to attempt to cover too wide a range of eventualities with the danger that none can be addressed satisfactorily. A clear view of realistic future commitments will serve to clarify the issue of which technological capabilities should be retained. It should be stressed that MoD and industry should form a joint view of which capabilities should be retained in DRA and which in industry as they are often interdependent. A major issue here relates to the retention of basic capabilities such as wind tunnels, radar cross-section modelling, antenna ranges etc, which are important for many industrial as well as DRA projects.

1.7 *The DRA has as its primary role the provision of research services to the MoD. How far should the DRA continue to provide other (non-research) scientific and technical services to the MoD?*

The role of DRA as originally defined in "The Future for Defence Research" (MoD, October 1988) was to "provide a scientific and technical service to support the current and future equipment procurement process. Research is the underpinning discipline for the two main roles, project support and applied research". The question seems to have inverted these roles, yet these services are the key element the work of the DRA, and are those which would be difficult to obtain commercially.

The DRA should continue to provide these services, which are often dependent on the specialised knowledge and experience of individuals. Continuity of experience is vital, although this should not be a reason to justify activities which could be better carried out elsewhere. MoD also needs to develop jointly with DRA and industry an overall policy on scientific and technical support services.

2. THE DRA'S MANAGEMENT, INTERNAL AFFAIRS AND CORPORATE STRATEGY

2.1 *Will planned restructuring and rationalisation affect excellence, or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?*

The outcome depends very much on the quality and structure of the management; at present the organisational structure appears to change too often by comparison with industry. Given good management and as long as efficiency measures are real, and not simply an artefact of the accounting system, then improved efficiency will lead to more excellence, through more available resource, and higher morale in the best staff.

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting-up of the agency?*

When rationalisation measures are agreed, they should normally be carried out as quickly as possible. There are indications that some measures within the DRA are being carried out too slowly, for various reasons including external political pressure.

2.3 *What are the implications of the new regime's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?*

The DRA can and should recruit the very best research staff with due regard to the need for managerial as well as technical skills. However for career development and technology transfer reasons, greater flexibility should be encouraged. Among desirable moves are a better "technical path" career structure, more short term contracts, more attractive arrangements for the secondment and more flexible and transferable pension arrangements.

Since UK industry is still shedding staff, and universities are not expanding, there is much uncertainty in the scientific and engineering community. DRA could therefore recruit good staff if its future were more certain. Continuity is the key and DRA's own announced redundancies will not help.

2.4 *Pathfinder is the DRA's programme to allow private companies to gain access to research at a much earlier stage and to contribute ideas which align with their in-company, possibly civil, research programmes. The projected advantages of Pathfinder include more value for money by prevention of duplication of research and improving take-up of promising ideas, and providing companies with the earliest opportunity to develop their ideas thus improving their wealth-creating potential. Is the programme worthwhile? If so, does it need refining and how can it be improved?*

It is far too early to comment on the effectiveness of the Pathfinder programme but it is a very important initiative to counter deteriorating technology transfer, consequent on "trading". One obvious problem is the 15 months period which elapses betwen the presentation of an idea and the award of a contract. The scheme should be expanded and extended by committing internal resources (money and men) to select jointly funded Pathfinder programmes in industry. Such extension will discourage "me too" programmes, improve technology transfer and will be increasingly important now that market pressures are shortening the time horizons of all industrial investments. Also, improved intellectual property arrangements should be offered to increase industrial confidence in the scheme. For example, compensation should be paid, if intellectual property leakage occurs.

Technical advice to the MoD on defence matters is the principal role of the DRA. This role will be fulfilled most effectively when the attendant research is, as far as possible, coherent with technical and commercial realities in the supply sector.

2.5 *How does the DRA identify future defence needs, and is its method of identifying such needs properly thought out?*

Future defence needs are identified by the MoD, not the DRA. DRA's role is to advise on how these might be fulfilled.

3. The DRA's Relations with Industry, Europe and the Wider World

3.1 *Is enough being done to link the DRA's defence-oriented concerns with civilian projects, and should civilian spin-off be a major concern for defence research?*

Where defence technology is led by the civil sector as, for example, in communications, computing and materials, the MoD, encouraged by the DRA, should take a broader view of programmes, giving more weight to UK industrial prosperity in the context of both civil and military world markets. Significant expenditure on civil spin-off involves too much second guessing and should be avoided. However, the general marketing of existing defence intellectual property is another matter. There is evidence that this is developing well.

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

For successful transfer of technology from the defence to the civil sector some necessary conditions are:

- consideration of the likelihood of successful civil exploitation when programmes are formulated
- a matching civil requirement
- a market that can be accessed and fulfilled
- staff mobility between sectors
- improved intellectual property arrangements.

3.3 *How does the DRA connect to the Technology Foresight exercise being conducted by the OST?*

There is no direct connection at present.

The Defence Science Advisory Council audits the DRA programme on behalf of the Secretary of State. The DSAC could form a defence sector committee providing advice to the OST Foresight Steering Committee.

In any case DRA should make inputs into the appropriate areas covered by the currently proposed panels.

3.4 *How effective are the links with the DTI, and is there too little DRA involvement in the DTI's LINK scheme?*

There is too little DRA involvement in LINK. In the past DTI has not sponsored the defence industry. This arises from the Treasury rules that only 50 per cent of a LINK programme can be Government funded. Hence in a joint DRA/ industry programme, industry receives no government contribution. Now it is a trading fund DRA could be regarded as an industrial partner for the purpose of LINK rules, so long as it constitutes less than 25 per cent of the programme budget.

3.5 *Has the DRA effectively filled the void left by the demise of Defence Technology Enterprise, and is the DRA any more likely to succeed where DTE failed?*

DTE failed because the concept that the DRA was full of ideas that defence contractors were unable or unwilling to exploit was flawed, and any similar concept which attempts to sell technology developed with an no eye to civil application will also fail. DRA, with greater freedom to exploit its IPR and the prospect of reward, may find more outlets, especially in partnership with industry. (See also the response to 3.1).

3.6 *What is to be the DRA's role in the issues of conversion and diversification in the defence industry as a whole?*

DRA has no specific role, unless asked for advice or contracted for specific help, but see 3.1 above.

3.7 *How should it relate to the part of industry which is not concerned with defence and how much should it focus on dual-use research?*

DRA should be encouraged by the MoD, to take dual use into account as far as is possible (see 3.1 above). Where relations with the civil sector then develop naturally, no inhibition should be placed on accepting viable exploitation contracts. In any case DRA should make the results of its non-classified research work widely available to UK industry.

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

See 1.4, 1.5, 2.3, 2.4, 3.2 and 3.4.

3.9 *What kind of relationship exists with the EC Framework Programme and other European (including non-EC) programmes, such as EUCLID and EUREKA?*

DRA has a broad knowledge of UK industry and has strong links into Europe. It therefore has an important contribution to make on behalf of UK in European research projects and such activity should be encouraged.

3.10 *Does the DRA seek European collaboration as a matter of course?*

Yes and it is the principal customer's (MoD's) policy too.

3.11 *Is there in other countries anything relating to the management of defence research from which the United Kingdom could learn?*

UK probably has one of the best managed defence research systems in the world and no doubt this contributes to the high standards of the Armed Forces and the outstanding success of UK defence exports. Having in mind practice in other countries, notably in Europe, it could be further improved by involving industry more in programme formulation, by improving technology transfer between industry and the DRA, and by opening up Government research and other technical information networks to industry, as far as possible.

Examination of Witnesses

Mr G J Lomer, CBE, FEng, FIEE, Vice-President, Dr J C Williams, FEng, FIEE, Secretary, and Mr S J Robinson, OBE, FRS, FEng, FIEE, FInstP, Consultant, the Institution of Electrical Engineers, called in and examined.

Chairman

490. Good morning, Dr Williams and gentlemen. We are grateful to you for joining us this morning. Would you like first of all to introduce your team, Dr Williams?

(*Dr Williams*) Yes, thank you, my Lord Chairman. On my left is Mr Geoffrey Lomer who most recently has been Technical Director of the Racal Group of companies and has recently retired. On my right is Mr Robinson who spent a large part of his working life working for Philips and for some seven or eight years recently has been a Director of the Radar Research Establishment at Great Malvern, who has also recently retired. My name is John Williams. I am Secretary of the Institution of Electrical Engineers and I have spent most of my working life managing research projects in Philips and in GEC.

491. Thank you very much. Is there anything you would wish to add on behalf of the Institution itself?

(*Dr Williams*) Yes, if I may, my Lord Chairman. The Institution is extremely interested in seeing that good quality research *is* exploited in the United Kingdom to help the wealth-creation process in the United Kingdom. We believe that research can produce negative results as well as positive results. It does not always, or often, actually deliver the results which you think you are going to get when you start the project, and it is usually not desirable to have price competition play too major a part in undertaking research projects. We believe that the quality of people who are undertaking the research, their recognition by their peers and their ideas are where the competitiveness comes in. So it is these interests which the Institution and its 130,000 members who work in industry and in the DRA have in good quality research that we are trying to get across today.

492. Thank you very much. Could I pick you up on one point you made in that very helpful introduction when you referred to wealth creation and defence research. Of course, the Defence Research Agency is charged very specifically with providing expert advice to the Ministry of Defence and, perhaps almost as a consequence of that, is required to undertake research in order to provide that facility and expertise. Would you agree that that is the role which the Defence Research Agency would be expected to put first on its list of priorities?

(*Dr Williams*) Perhaps I can ask Mr Lomer to take that one.

(*Mr Lomer*) Thank you, Dr Williams. My Lord Chairman, I think that in recent years it has been very clearly stated that the role of the DRA on the procurement side of the MoD is specifically to support the Ministry of Defence and almost totally to the exclusion of considerations of industrial prosperity. That has, I think, caused industry some anguish. We are very interested that the White Paper recently published by the OST—"Realising Our Potential"—focuses very much on using government investment in R&D across the whole purview, with one of the prime objectives being wealth creation. We very much hope that this will now spread across into the MoD's research work, to include that as one of the considerations which at least will be taken alongside others in making decisions on their work.

493. I was really asking you if you would agree to give an element of priority to this. I quite understand that where wealth creation is possible alongside the primary function, that would in all cases be desirable, but would you accept that the DRA has a responsibility to advise the Ministry of Defence primarily?

(*Dr Williams*) Mr Robinson has a point to make on that.

(*Mr Robinson*) Yes, my Lord Chairman, I would certainly say that advice to the Ministry of Defence should be its priority, and I think that all research needs to have that sort of clear objective. However there is not the dichotomy which perhaps is implied, because within that priority is the theme of buying the best and most appropriate equipment. Therefore, the health of the defence industry is, I would say, a logical element within the core priority, and it is but a short step in logic from there to saying that the health of the defence industry includes its exports. Therefore, I think there is a direct and legitimate wealth-creating dimension to the DRA's main task. Having said that, the main objective must be quite clear, and it is the defence of the realm.

494. I think Lord Dainton would like to come back on this point in a moment, but first I should like to ask you a point of a slightly different nature which refers to the first question on our list which I think we

[Chairman *contd.*]

submitted to you. I should like to ask for your comments on your remark that "the trading procedure and the organisational environment which can be detrimental to innovative ideas need to be streamlined". I think we would be most interested to have some ideas as to what needs to be done in that respect.

(*Dr Williams*) We are, in the Institution, pleased to hear that the DRA has been set up in a manner similar to industry, with similar trading conditions, but we have to make it succeed. Although the more commercial approach is to be welcomed, the trading and the financial arrangements which may succeed in industry for development and production projects need to be very carefully exercised in undertaking research programmes. We accept that the detailed knowledge of the full economic costs incurred and the clear objectives and the sharp focus are important in planning research, but the planning should not be over-planned to the extent that it is operated at the working level on a day-by-day and week-by-week basis. The tight financial controls should not operate into that low level in the management structure, because scientists need to be flexible; they need to have a cross-fertilisation of ideas through their peer group and their colleagues (internationally as well), and any over-concentration on a day-to-day management of finance and time controls will lead to the scientist concentrating on that and not concentrating on picking up avenues of research which from day to day he thinks are worth pursuing. However, the scientist and engineer have to be accountable for what they have done at the end of the day. We do believe that the detailed planning actually helps focus the work at the start, and scientists and engineers should be involved in that, but then they should not be held accountable to that programme necessarily in their approach to the work. So that is the streamlining which we are referring to in our written evidence.

495. Do you think there is a danger that the financial targets which have been set and the financial accountability in turn will lead to obstacles in achieving this performance?

(*Dr Williams*) Research, by its very nature, is difficult to plan both in terms of timescale and financial objectives. We believe it is important to do it at the start of a project, but if the scientists are held to that, then yes, we do believe it will be an obstacle sometimes to achieving the result which you want. However, it has to be monitored. The programme must be monitored, let us say, every six months, otherwise the cost may be more than the risks involved.

Lord Dainton

496. This question arises from what you said earlier on and also from what you say at the end of paragraph 1 of the covering letter where you state that "Continuity and expertise of staff is very important" and "the continuity provided by the DRA is a vital aspect of their work". From what you have said, and from what you say there, I get the kind of feeling that instead of a Defence Research Agency as construed by the Government, you are almost looking for a Defence Research Association, going back to the old independent Research Association principle of here is a government body supported partly by government funds, doing work to the benefit of industry as a whole, and in a sense the new technology thing is another expression of that. Are you not saying that that is a very difficult concept to handle?

(*Mr Robinson*) I do not think, my Lord Chairman, that we would go that far. Certainly we believe that if the DRA happens to be the best place to undertake a piece of research, then industry should be free to contract it there.

497. When you say "contract" do you mean by industry to DRA?

(*Mr Robinson*) By contract from industry to the DRA to do work for industry in the DRA. I think that that should be a possibility which is allowed within the system. The way you put it, I would say, goes away from the point that the objective of the DRA is advising the MoD technically, particularly in relation to equipment procurement. I think its chief role is best performed as a customer-owned laboratory or as a user-owned laboratory. When we are talking about 'trading' we are talking about financial control mechanisms to optimise the efficiency and effectiveness of the DRA.

498. My question is really directed to the point about whether it is possible to have these two roles within the same organisation, bearing in mind that research which is done for the Government is perfectly straightforward, but there the DRA is advising the Government on how to choose between contractors. On the other hand, if it is doing work for contractors and the property belongs to the contractors, it is in a very difficult position, is it not?

(*Dr Williams*) Let me ask Mr Lomer from industry to reply to you, my Lord.

(*Mr Lomer*) I think that it will be difficult to disagree that the position could be complicated. I do not believe that it is so difficult that it should not be pursued. One has to look also at what happened before the current arrangements were put into place. Then the establishments were placing work with industry sometimes, they were doing work themselves sometimes, and that judgment was made principally on the quality of the technical expertise available. It was muddied sometimes by the fact that the internal costings within the DRA were quite different to those used in industry and so sometimes a decision might be made the wrong way round to do it within the establishment instead of outside because the playing field was not level. I think that what is being done now levels it. In the other direction the amount of work which industry has placed with the establishments (and some has been done jointly with the DTI and so on) has been small and that hopefully will increase. I think the thrust of my feeling is that what we must pursue is that the decisions on placing work are driven mostly by the quality of the research and the price does not become, as it would in many other commercial environments, the overriding factor. We must still look at the quality of the expertise in the research, in both directions.

499. But in order to keep that quality up, as you say somewhere else, I cannot remember exactly where,

[Lord Dainton *contd.*]

you do make the notion that the research surcharge is a thing which should be pursued by the DRA. I think I am correct in that, am I?

(*Mr Lomer*) Yes. I think what one needs to do is to examine what happens in industry to fund the more speculative non-focused research, and that is normally done in large organisations by some form of levy on sales or on the operating companies. At least there is some money which is available to fund that. There is a danger at the moment with the way the DRA structure is being organised—it is more than a danger, it is a fact that there is not a source of that kind of money unless it is agreed specifically from the Ministry of Defence on projects—that was the point we were trying to make in our comment.

500. Would that kind of contract drawn up with industry bearing a research surcharge be acceptable to industry as part of maintaining the technical expertise and advanced knowledge of DRA?

(*Dr Williams*) I think in the main it probably would. In large companies they often have to choose whether to undertake their own research or to place a contract with another company, agency or establishment outside and industry are used to making those decisions. I think the important thing is to keep some research for wealth creation in the United Kingdom. To keep the technology within the United Kingdom, industry would probably be willing to place contract research with the DRA.

501. That in a sense brings us on to question 2, does it not, because you obviously have some concerns, as I have, about the management of this business and you say: "the package management procedures need to be simplified" and you want "greater interaction and visibility". Can you explain what that means?

(*Mr Robinson*) Yes, I think one has to start, my Lord Chairman, from the point that when customer contractor arrangements were instituted (and I see this as the key change that has happened in setting up the DRA) the medium-term research budgets which cover the bulk of the programme, were associated with military function packages, and given to the operational requirements staff. These are military officers who are not technical experts and are on short-term postings. It was seen to be appropriate that the DRA should appoint independent (by reporting directly to the Chief Executive) package managers to act as advisers to these gentlemen in the research programme definition and selection process. Of course, the first thing to say is that package managers need to be independent. There is a confidence problem with industry which we may come to later, but this question relates to efficiency. It is very important that research workers have direct contact with the end user. Even the operational requirements man is a surrogate end user and there is the risk that the package manager will come between the research worker and, if you like, his real customer, the fighting man in the field. So he must be very careful to be a facilitator rather than middleman. Moreover, there have been rather complicated procedures set up to translate the military requirement into technical needs and programmes. Package managers are a key part of this complicated process which we think said should be streamlined.

502. But in a sense you are saying it is an extremely complicated process and therefore we must streamline it, but one could equally say it is a very complicated process and therefore difficult to streamline?

(*Mr Robinson*) It is not that the streamlining need is not seen. It is a challenge to streamline. If I can make the point, if the research worker in the DRA only sees the package manager and his administration procedure; if the industrial research worker only sees the package manager; and if the customer himself—the operational requirements staff—only sees the package manager, then that will be undesirable for the quality of research. I think that there is a tendency for the complicated administrative programming process to push matters in that direction.

503. It seems to me from what I have heard that they thought a great deal about this. It would be helpful if you could give us some idea of the kind of structure you would want to have to ensure these desirable ends in this complicated system in writing.

(*Mr Lomer*) We will come back in writing.

Chairman] I think that would be an appropriate way to deal with that answer.

Baroness Hilton of Eggardon

504. In your evidence to us you suggest that the rationalisation process which you have been talking about is slowed down by political pressures. I would have thought political pressures would actually speed it up. Could you perhaps explain further in that what way it is slowed down?

(*Dr Williams*) It is political with a small "p" and I think perhaps political and social pressures are probably what is meant by the statement.

(*Mr Robinson*) My Lord Chairman, I think one must put our answer in the context of the question which was: "Is the rationalisation process proceeding too fast to the detriment of morale?". In the context of morale—it is widely believed in industry that rationalisation must be undertaken very quickly because of the uncertainty surrounding it. Once the studies are done, the announcements need to be made fast and implementation needs to be fast otherwise there will be uncertainty and morale problems. The general point we were trying to make was that it is difficult to undertake rationalisation fast enough and that there are obviously practical problems slowing it down, which are not fully appreciated from outside. As I see it, bringing the Establishments together under a single management structure has helped the process of administrative rationalisation through the possibility of centralisation of administration. It has also helped programme rationalisation by allowing streamlined programme management and reducing overlap between Establishments. So I would see satisfactory progress in these areas. An area which has always been difficult for Establishments in the public sector is the way assets are handled. This is perhaps where the political point comes in. The customer is very loathe to see assets which might be of value in war dispensed with. There is an "insurance premium" for such under utilised assets and not many customers are willing to pay it. There is also a question, when it comes to geographical sites

[Baroness Hilton of Eggardon *contd.*]

and employment, that these were often located in remote areas during the Second World War. So there is always particular employment sensitivity when sites are to be closed. I think the sensitivities in these areas are more keenly felt in the public sector than in the private sector. One has only to look at the recent dockyard experience to see that these are difficult issues. Whether it is perceived or real, there is always the wide public dimension to site closure debates. However, I think the key point here is not political at all, but relates to the way asset costs bear down on local management. The vote system in the past has not caused asset costs to be seen by local management and therefore the incentive to rationalise assets has been low. Of course, the trading fund in the DRA has changed that, or is changing management, but it is a difficult and long process. I am not directly in touch with events, but, as I would see it, asset rationalisation has been slow. This is probably explained by the need to change the asset management procedures in going to the trading fund, but I go back to my first point that the faster, the better.

Lord Howie of Troon

505. In paragraph 2(1) you say that the organisational structure appears to change too much by comparison with industry. The DRA have not been there terribly long. Do you think this condition is inherent in the DRA or do you expect it to settle down?

(*Mr Robinson*) Yes, I certainly accept your point that it is early days to say whether things are happening too often or not. It certainly is true that in the run-up to forming the DRA and then in the DRA itself there have been quite a number of iterations in the organisation. I think the spirit of the point we might make here is that that iteration has probably been necessary in feeling the way to the new structure in the new agency regime. There is now a distinct need for stability. This is not a complaint that there has been too much change so far, but it is saying that there *has* been so much change so far that for the health of the service stability is needed from now on.

506. Yes, but it seems to me that if, in a relatively short time, there has been too much change, you might expect that to be due to something like panic or a sort of confused urgency and possibly even a lack of clear aim. Is that right? Do they know where they are going, do you think?

(*Mr Robinson*) I do think they know where they are going. The nature of the agency has been fairly well spelt out and fairly well understood. Of course, the study of possible changes preceded the Robin Ibbs Report. Mr Heseltine instituted studies of this nature quite a long time ago in the Ministry of Defence. So I do think the objectives are clear. If you iterate in trying to reach the optimum arrangements, then the point can be made that you should have gone a bit more slowly and iterated a little less often. There has been pressure to make changes quickly—for example, the introduction of commercial accounting where I think there was an unrealistic over-enthusiasm. However, I would not call it panic.

Lord Renwick

507. Can I follow on that question and ask Mr Robinson this: it may be that they know where they are going, but are they able to maintain as effective a position *vis-à-vis* the Ministry of Defence? They have been set up to take a competitive position. Are there implications for their competitiveness with industry? Can they still fairly advise the MoD on the formulation of requirements and the relative merits of competing tenders on the one hand, while themselves competing with industry on the other? I have asked three questions there!

(*Dr Williams*) Perhaps I could ask Mr Lomer to concentrate on the industry side.

(*Mr Lomer*) My Lord Chairman, there are a number of aspects to what has been said. I think the key way of responding is to return to something we said earlier, which is that the objective should be to look for the special quality and the special technical expertise. In response to the last part of your question—that is, can the DRA advise on where to place contracts when they themselves are competing for that work?—in a sense that has been so for some time in certain areas, that they have had to decide whether to do work internally or to contract it out to industry, and that judgment was made principally on the quality of technical knowledge. As long as price does not now become the key element in that decision, I think we are not unduly concerned, and in fact we are more happy that the playing field, as I have said just now, is more level in making decisions. In other words, it will not be possible for the Agency or for the establishment to say it is much cheaper to do work internally than to put it outside. As an industrialist, that is an argument we have often heard before, and our response was "Well, that was because you don't bear the costs of the assets and so on". I am sure these arguments are very familiar to you. That hopefully will now be less the case, so we do not see it as so much of a problem. However, if price became *the* sole criterion or even the principal criterion, then there could be a danger, I think, that the decision-making process would become very difficult for them.

508. Price apart, is there the confidence of industry which would have been with the DRA beforehand, of total openness because of the competitive position? Do you see that as a problem in the future, that the DRA might not be aware of the latest developments in technology in certain areas because of the competitive situation?

(*Mr Lomer*) I think that again it would clearly be wrong to say it is not a potential problem. There clearly could be a problem there. However, as long as it is managed properly and the decisions on placing work are made openly with the package management scheme and the other schemes, then I do not believe it would become a major problem. Clearly, though, it would be wrong to say that there is not a danger that the interchange of ideas and people would become less. I think it is a danger which has to be watched.

Baroness Platt of Writtle

509. You say in paragraph 1.5 that "in many areas there is little direct competition". I presume you mean there is little scope for competition. On the other hand, the MoD has stated that the work the DRA carries out for the Procurement Executive should be subjected progressively to competition with the aim of achieving 100 per cent within four years. Are there areas in which competition is both possible and desirable, or would you constrain it?

(*Mr Lomer*) I think that when we spoke about—quoting our own words—"in many areas there is" still "little competition", we really had in mind the possibility of using price as the competitive element; that in many areas it is not clear to us that price would be a possible way of setting up competition. Going on to the second question, there clearly are many areas where technical and accordingly price competition would be possible. Indeed, returning to the theme of a few moments ago, I do know from personal experience that there have been situations where industry has been developing skills and products with an eye on the export market, in advance of a defined requirement from the United Kingdom MoD, where there has been quite a lot of reluctance from the establishments to turn to industry, even though there was real opportunity there for placing work with people with higher expertise, because perhaps they wanted to protect certain organisational things within the Agency.

510. Or the "not invented here" syndrome perhaps?

(*Mr Lomer*) "Not invented here", or in times of financial pressure clearly placing a contract outside might mean having to reduce staff or not replace staff inside. It is human nature to want to keep it inside. So hopefully that will be better. There are many areas like that where I think the competition now would be much more with a level playing field, and we could identify many areas where that could happen.

511. Passing on to the Pathfinder programme, which is of course again a place where you are wanting to increase industrial confidence in the scheme, we have been told that there has been specific experience of commercial-in-confidence, unsolicited proposal ideas being used as the basis for a competitive bid by DRA groups who have ignored copyright. Have you had experience of that kind or not?

(*Mr Robinson*) I certainly have not had experience directly on that. I must say, that accusation does slightly surprise me. The record of the establishments of the DRA in this area, I think, on the whole, has been very good. There is no doubt that Pathfinder is a very important initiative, particularly from the point of view that Mr Lomer has just alluded to—that the DRA has not got a monopoly of good ideas. Therefore this is a mechanism which introduces to the total national programme the best research ideas. I feel the objective of Pathfinder, among other objectives, should be that the proposals are so good that the DRA does not want to duplicate them, but does want to start collaborative and complementary programmes so that there is a good collaboration—a LINK type of collaboration—and an introduction of the market forces and the production technology forces which apply in industry and do not apply in the DRA. By "market" I mean the world market, defence market. It puts the whole research in a healthier context if there is a healthy Pathfinder programme. I think there is no doubt that because of the uncertainty as to what competition meant in the first round of Pathfinder, there was disappointment in the quality of proposals. I have no doubt (although it is a supposition) that that does relate to industry thinking to itself, "Well, dare we put in our best ideas? Will they be passed to our competitors or done in-house?". I think one has, of course, to put all this in the context of research. It is normal for peer groups to choose research programmes. No one has discovered a better way and, of course, peers in a peer group always have some self-interest and it is not a perfect process. I do think one must appreciate one is talking about research and it is quite difficult for a research worker to say, "Well, I can have a better idea than he can have. I see his good idea but I will go away and have a better one." That is quite a difficult one and a courageous thing for someone to do. I think there are perhaps exaggerated perceived problems here, but I do think one must strive to get Pathfinder better with more confidence. For that reason I would support some much stronger confidentiality rules; perhaps compensation if somebody can point their finger at somebody playing fast and loose with intellectual property that they pay for that. Of course, the Government has not in the past been very receptive to actions of that sort. It does not normally like paying compensation for various reasons.

Chairman

512. Could we just pursue further the point about intellectual property rights and not so much their abuse. The policy at the moment of trying to maximise intellectual property rights within the DRA is clearly in their framework document seen as a source of revenue. Do you see any conflict in the function of DRA helping the defence research base in the ways that you described and also maximising its income?

(*Mr Robinson*) It is the difference between practice as opposed to the theory which is the problem with intellectual property. There seems to be no reason to doubt that rights and in particularly patents are there to encourage technology transfer, by encouraging inventors to exploit their inventions ensuring a reward for that exploitation. I do not see why these market pressures should not apply, and therefore I would argue that by looking to maximise intellectual property income DRA will get the best spin-off into the civil sector, and will improve technology transfer to the military sector. I have to say, of course, that in practice (and it is partly to do with scientists not being familiar with these things) scientists invariably underestimate the downstream risks and investment costs. They do not see them, so they think they are not there. "Intellectual property rights" discussions are very difficult, do take a long time and it is frustrating that striking such deals should be so complex. If industry can do it cheaper themselves, well, they will reinvent the wheel, but they should not do that. They should pay somewhat less and buy the wheel from where it was first invented. I do think that DRA should pursue intellectual property income to optimumise the exploitation of research investments

[Chairman *contd.*]

but should also strive to educate its staff to carry out speedy and realistic negotiations.

(*Dr Williams*) Mr Lomer had a view from industry.

(*Mr Lomer*) I would firstly like to make a comment which is not at all helpful; that is that the whole field of IPR is complex and thorny and many previous organisations have struggled with it. I think it would not be right to give the impression that it can be instantly solved by some decision. Even where there have been joint programmes between industry and government, like the Alvey programme that the DTI and other agencies ran, the IPR was always a great problem. I think it would be wrong to say it is easily solved. The other comment I would make, and I think Mr Robinson referred to it, is that one of the problems I think that industry would identify is that when we are talking of research at a fairly strategic level there is a view from researchers that the value of the ideas is very high, whereas industry would probably say there are a lot of good ideas around. It is the identification of the ideas and taking them forward to something that will actually generate wealth that is the difficult part. So there is a conflict, but I think the research groups and the research individuals have perhaps an inflated concept of the value of their ideas and that is also sometimes a stumbling block when it comes to that negotiation.

Chairman] Hope springs eternal in these matters.

Lord Craig of Radley

513. You may remember that we asked you whether there were any lessons that we might learn from other countries about defence research and you start your answer by saying we have probably got one of the best managed defence research systems in the world, but then you go on to suggest that there is scope for improving technology transfer between industry and the DRA. I wondered if you could expand a little on your thinking there?

(*Dr Williams*) The popular myth is there are just lots of technologies sitting around in cupboards waiting to be exploited.

(*Mr Lomer*) I think we can look at technology transfer in one or two different ways. Probably the principal way we should be thinking about is technology transfer in terms of bringing defence technology into the manufacturing companies which are going to exploit it, both for the MOD and hopefully, as I said earlier, for export. I think that one of the things that we see there is the importance of getting programmes jointly together between industry and the DRA and the MOD procurement staff is at an early stage. It is always difficult to transfer technology downstream in the later stages. The second thrust of technology transfer is transferring it into the commercial sector for non-defence applications. There I think the thrust is exactly the same but even stronger, that unless there is an identification of the commercial opportunity very early in a programme then the probability of success is quite low. I think, as Dr Williams said, that there is an idea which sometimes one hears that there is a great deal of technology lying around inside the DRA establishments which only needs someone to go and pick it up and suddenly they will get very rich. Firstly, this is a flawed concept and, secondly, when Defence Technology Enterprises was set up to try and pursue that concept it did not work very well. The reason it did not work very well, in my view, is that it was never a concept that was going to work. So I return to the first theme that we feel that early identification of opportunities with the intent to get technology across into industry is the key. Swopping people, if that can be arranged, would be a great help, but do not leave it, and then hope that some "magic box" will emerge, because it will not happen.

Lord Howie of Troon

514. Arising from what you have been saying, in paragraph 3(1) on page 7 you say that the MOD should look more widely into civil and military world markets. You then go on to say, I think quite importantly: "Significant expenditure on civil spin-off involves too much second guessing and should be avoided." Are you telling us that civil spin-off is more of a dream than a reality? You came fairly close to it earlier on.

(*Mr Lomer*) Yes, I would really replay what I said just now. I think if early identification of some opportunity is found so that the expenditure can have point or identified objectives then quite often those things work. We can look at pieces of work in electronics in other areas where there have been actual applications, but what does not seem to work is working on a defence project and hoping at some point in the future there will be a spin-off and maybe one day we will find a civil application. Usually that does not work and I think that is really what we were trying to say there.

515. People have quite often in the past justified certain areas of expenditure by a sort of last resort argument which was that civil spin-off would occur. Would you find this mistaken?

(*Mr Lomer*) This is a somewhat more personal and cynical view, but I think that that argument is often used to justify expenditure in particular areas. If there is to be a civil spin-off one would hope that by identifying it early and pursuing that civil line it would be much more effective than going down the mainstream and hoping you will spin-off something later.

(*Dr Williams*) There were projects in the Alvey scheme in which the defence establishments, the Ministry of Defence, civil establishments and industry identified common areas of research at the start of the programme and worked together on those programmes. That is the sort of thing we are talking about where we refer to looking at the problem early.

Lord Dainton

516. Would you have regarded the Alvey programme as a success? I ask this because you cited it yourself. Is not the evidence that Britain's share of that part of industry world-wide declined in that period and continues to decline? Are we trying to chase a miasma?

(*Dr Williams*) Obviously you can try to relate the two of them, but it begs the question of whether our share of world trade would have declined further without the Alvey programme. Yes, I think the

[Lord Dainton *contd.*]

quality of the research undertaken by the Alvey programme was successful. In comparison with European collaborative projects, perhaps the end-user was not brought into the Alvey programme, in the way it was with the ESPRIT programme and other programmes, early enough. It was perhaps, looking back, a mistake.

517. So you are saying it is possible to work out a scheme which will achieve what we want to see, through the skills and knowledge of the DRA, and which, carefully orchestrated, may lead to this?

(*Dr Williams*) Yes.

(*Mr Robinson*) If I could add a comment to that, I think there is a delicate balance. A mistake sometimes made is that the blue-skies research is looking at the blue skies for inspiration. I strongly believe that the higher the risk, the more scientists need to be clear what they are trying to do. So I think it is important to have a clear vision of the goal. Although a research programme is very often a common base to many applications, that does not mean that the work does not need a sharp focus. I think it would be wrong to concoct a programme aimed simultaneously at a civil, an MoD, and a military operational application. It would be better to merge the civil and military requirements and have a programme with a single aim.

Chairman

518. Dr Williams and your colleagues, we have been through the list of questions we were proposing to ask you, and you may have noticed that we have asked you a few others about which we gave you no notice. Thank you very much for the patient way you have answered our questions. It has been very helpful to us.

(*Dr Williams*) Thank you very much for inviting us. It has been a pleasure.

Supplementary Memorandum from the Institution of Electrical Engineers on "Package Management"

INTRODUCTION

The Institution presented oral evidence to the Select Committee on 17 March 1994, and was asked to prepare a written submission on a structure aimed at streamlining the Package Management System. The aim of the Institution's proposals is to ensure that researchers have greater interaction with end users and to improve the effectiveness of the research programme. The Package Management System is the arrangement by which the Ministry of Defence implements its medium term applied research programme. The budgets for this programme are in the hands of the Operational Requirements Staff, reporting to Deputy Chief of the Defence Staff (Systems). The research precedes the preparation of "Staff Targets" and "Requirements" but is clearly aimed at military tasks, and new equipment needs.

Concern about the operation of the Package Management System has been expressed both from those working in industry and in the DRA. Clearly it is possible that these concerns may simply reflect the initial reactions to a major change in the planning procedure, and it may well be that there are improvements in hand of which our members are not fully aware. Our observations made here, being made from outside the MoD without an intimate detailed knowledge of the current situation, are therefore of a general nature outlining broad principles rather than specific detail. In so far as they may cover improvements already in hand within the DRA, that can only be a matter for satisifaction.

The best management structure and administrative process to achieve a particular task will depend on the nature of that task, and on the environment and the staff available. Research is an unusual task and the DRA, as a customer owned operation, trading in defence research, presents an unusual environment. It is therefore important to list the axioms which provide the framework within which the structure and process must be effective.

These are believed to be:

1. Research programmes are best defined by those carrying out the work and it follows that there must be strong interaction with military "users", so that objectives are clear and the environment is well understood.
2. Negative results and peripheral observations are important products of research. The work should be well focused, but objectives need constant review, without undue impediment from contractual commitments or the financial management system.
3. Relevant excellence in research has merit in its own right. It provides access to knowledge and ideas from peers around the world. Individuals benefiting from such peer group exchanges are well placed to be preeminent advisers. Thus excellence is an important efficiency measure.
4. To fulfil its main function of providing technical advice to the MoD, the DRA requires knowledge of the commercial and manufacturing environment of the defence industry, as well as research based knowledge, continuity of experience and an understanding of the military environment. Thus, it will be important to exploit complementary strengths of the DRA and the defence industry through collaborative research. Otherwise technical advice from the DRA will not be good enough to avoid costly mistakes in equipment procurement.

5. Competition is an essential stimulus to good research, but must be on the basis of "expected value for money" rather than on price. Of the three factors that determine "expected value for money" (cost, "probability of success" and value added), "probability of success" is difficult to predict and variable. It therefore requires regular review and reassessment.

Desirable features of Package Management

On the basis of the above axioms, desirable features of the Package Management system should be:

1. The annual MoD review in which the programme is rematched in detail to the Long Term Costing (LTC) plans has led to procedures which are over complex in terms of the minor changes to programmes actually achieved. Moreover, if the LTC based review extends deep into the technical programme then this will be inconsistent with the satisfactory development of DRA's trading activities. Thus the LTC system should be confined to the allocation of budgets to military needs within the MoD, and contracts in line with these budgets placed in response to proposals from either industry or the DRA. These proposals therefore will directly address the "Statement of Military Need" (currently known as "Form A"). Thus the statement of "military need" should be made available to both industry and the DRA.
2. To avoid nugatory proposal work, Package Managers should hold seminars to discuss priorities and available budgets, but they should not specify the technical content of programmes.
3. The DRA must maintain a broad knowledge base to fulfil its primary function of technical advice to the MoD, so it should be mandatory that proposals from Industry include a significant element of collaboration with the DRA. Sometimes it will be best for the DRA to bid alone, but they should be required to explain why an industrial contribution is not appropriate.
4. Proposals should include justifiable value for money claims and suggestions for monitoring "profitability of success" as the project proceeds. Contracts should allow projects to be terminated or redirected, if the "probability of success" falls to an unacceptable level. Having taken the role of facilitator in the proposal phase, Package Managers should lead the programme selection process and monitor projects, on behalf of the Operational Requirements Staff. They should call upon peers, from inside and outside the DRA to assist openly in these tasks.
5. While costs incurred and anticipated should form an important part of regular project reports (say, every six months), progress should be measured in terms of "probability of success", and, subject to budget ceilings and reasonable notice, Package Managers should be able to divert resources from less promising to more promising work. Research is a long term activity, and this flexibility will allow contracts to be placed for programmes extending over several years at acceptable risk.

Conclusions

The "Long Term Costing" system of budgetary planning should be confined to the MoD, and the DRA and Industry should be put on an equivalent trading footing with both parties free to respond to stated military needs. However, to ensure that DRA maintains its capability to give sound techical advice to MoD only collaborative proposals between the DRA and Industry should be considered except in certain cases where a bid from the DRA acting alone can be justified. Equivalent proposals will be rare, and selection should be based on merit, within available budgets. Relatively long term contracts should be encouraged, but these contracts should allow resources (within limits) to be switched from less promising to more promising work. The management of customer budgets, in line with long term costing, should be the main task of the Packaging Managers. To this end, and on the basis of peer review and appropriate progress reports, they should advise the MoD on resource switching and the selection of new work.

Memorandum from Sir Ronald Oxburgh KBE FRS

THE ROLE OF THE DEFENCE RESEARCH AGENCY

SUMMARY

Modern high-intensity warfare is so technically complex that, for any country that intends to participate in it, having access to its own technical expertise is as important as having its own forces. Frequently what is needed is speedy technical improvisation; armed forces that work with sophisticated communications, sensors and weaponry have to have such support by some means or other. It may not matter whether this expertise is found within the armed services themselves, the civil service, private UK industry or with allies; the essential feature is that it should be broadly based, of high quality, independent, dependable and available rapidly in an emergency. In the UK it is largely provided by the Defence Research Agency.

The DRA exists for the purpose of providing scientific and technical support to the armed services that is not available elsewhere. In spite of its name, research is only one of the two broad kinds of support provided to the services by the DRA. The other, and possible more important kind, is technical advice which draws on

the broad base of military technical expertise that research activity sustains within the agency, whether the issue is to recognise threats presented by new weapons or by new technologies, or in an emergency to propose counters to new weapons or new tactics, or dozens of other applications.

It has been government policy for some time to transfer as much defence related research as possible to private sector manufacturers of defence equipment, and for that research to be funded by them in the expectation of cost recovery from later production. This policy evolved under the implicit assumptions that the technological race of the Cold War would continue and that there would be a relatively vigorous defence industry. Neither assumption was realised in the event and this policy has had mixed results. The problem is that much defence research is rather specialised and that in a period of détente there is little incentive for industry to commit its own funds to support it when there is little prospect of production; an important area of national expertise found only in industry could therefore lapse. It follows that if it is a national priority that a particular capability should be retained, it will probably have to be paid for by MoD, whether it is in the DRA or the private sector.

This industrial policy was complemented by the foundation of the DRA and by establishing a trading relationship between it and the MOD. Operating funds that previously had been allocated to establishment directors to run their laboratories were allocated among a range of MOD customers and must be won back by the agency in the form of contracts. There is a significant overhead cost associated with this more formal contractual interface but is presumed to be offset by the efficiency gains that the new approach carries in its train.

There have also been parallel moves to civilianise and/or privatise a number of technical support functions previously carried out by the armed services themselves.

It is against this background that the DRA has to be assessed. It follows from what was said above that the scope and scale of defence research activity may broadly be expected to reflect the scale and pattern of defence expenditure as a whole, ie, it will reflect the sophistication and diversity of the weapons systems needed to implement national defence policy.

Turning first to finances: there is inevitably an element of artificiality about the business arrangements for the DRA which is required to meet business targets related to a fixed rate of return on the assumed capital value of the assets it employs; however, the value of the assets is to a degree arbitrary (and is arguably too high). Thus the full costs that the DRA charges its customers in order to meet its targets reflect these valuations; if the prices are too high they may look elsewhere. This approach has, however, provided a welcome driver for site rationalisation and withdrawal from small sites that were no longer essential or economic, and has gone hand in hand with tighter management and a significantly increased awareness of and attention to customers' needs.

On the research side there is some concern that longer term research may suffer from the new arrangements because funding is dispersed through a large and diverse group of customers with constantly changing personas and priorities. This is a potential danger but it is part of the role of the Defence Research Committee within MoD to see that this does not happen. Diversity of customer funding can, however, make it more difficult to pursue longer term collaborative projects with allies.

Privileged access to defence contractors' research programmes and plans that was enjoyed by the old research establishments has declined to some extent because the DRA is seen as a potential competitor and because contractors are expected to pay for what they get from the DRA. This has made it more difficult for the DRA to give MoD advice based on a comprehensive technical oversight of what is being done in the UK as a whole.

In the old research establishments there was relatively little direct incentive for technology transfer to the civil sector (but transfer did in fact take place on a wider scale than is generally recognised or acknowledged). The DRA now has business incentives to promote transfer.

The DRA is still very much in its formative stages; in its present form it could well succeed technically and possibly financially too; but if it becomes apparent that the financial targets are unduly harsh and will threaten the viability of the agency, they should be relaxed. Above all, the agency needs a period of relative organisational and financial stability, to give it a chance to establish itself.

Introduction

Few would contest the general proposition that warfare at all levels is becoming more technologically sophisticated. This is true of equipment, of the means of making command decisions, of managing logistic support, and of a host of other activities. Other things being equal the forces with a clear technological edge over their opponents can be expected both to win and to do so quickly and with fewer losses. This could be seen as one of the more obvious lessons of the Gulf War. The role of the defence technical community in the UK is to ensure that British forces go into combat with the keenest technological edge, that can be afforded.

The central element within that community is the Defence Research Agency. The DRA was formed by the amalgamation of the main non-nuclear defence research establishments and since 1 April 1993 has operated as a Trading Fund. The resources traditionally allocated to Research Establishment Directors to manage research programmes for MoD, now rest with MoD customers who judge the priority of technical programmes against their other needs. Formerly Directors of Establishments had a fair degree of autonomy to take a long term view on the technical needs of MoD, to manage research programmes and to ensure their coherence and balance; this, however, was at the price of a degree of unresponsiveness, programme costs that were not always clearly visible from the centre, and some inefficiency and duplication of activity resulting at least in part from organisational and geographical dispersion.

Under the new arrangements customers' research requirements are brought together into blocks of work known as research packages based primarily on specific military functions; each package is the subject of a contractual arrangement with the DRA. Elements of work are clearly priced and MoD research is open to scrutiny by both customers and the Treasury in a way that is quite new.

The establishment of the DRA as a Trading Fund has imposed some stringent financial disciplines and in order to show the return on capital expected by the Treasury, it will be necessary to reduce overheads substantially by withdrawing from a number of sites and reducing staffing levels.

These major changes in the way that MoD goes about research have come about at a time of profound world change and of significant reduction in the resources available for defence as a whole. It is therefore appropriate to reconsider the role of UK defence research and the part it should play in the new scenario.

Background—Research Customers

There are now three main customers for research in MoD. Long term or Strategic Research is the responsibility of the Deputy Chief Scientific Adviser (DCSA). This amounts to about 8 per cent of the research spend and is the area from which totally new concepts or devices are expected. This work is largely carried out in the DRA and other MoD agencies although there is some involvement of industry and universities. A significant fraction of strategic research projects feed through into the Applied Research programme managed by the Deputy Chief of the Defence Staff (Systems) (DCDS(S)). This is the greater part of the research programme and has as its focus work bearing on systems that could come into the programme during the next five to 10 years. Finally there is the work that is commissioned by the three Controllers (chief procurement officers for each of the armed services) in support of current projects; it is sometimes argued that such work is not strictly research and should be classified as development. This is not a particularly profitable argument. The fact is that the work is very similar to, and indeed often depends on, some of that done in the strategic or applied research programmes. The main distinction is that project support work is regarded as completed as soon as a solution is found to the particular problem in hand, while in the main research programme, the aim is to achieve a more widely applicable understanding of the area in question.

Research and the Defence Science and Technology base

The concept of *customers* for research might suggest that research is a well defined commodity that can be bought and sold like other goods and services. In general it is not. It is different in several ways. Research is to a greater or lesser extent a venture into the unknown and the results cannot be specified in advance. The best that a customer can expect is that a properly planned programme with clear objectives is carried out efficiently in the best professional manner. For MoD, and indeed for all organisations that depend on technology, a more important difference is that by procuring research they also help maintain a broad technical capability—one on which MoD has long been accustomed to draw and which it will continue to need in the future—the "Defence Science and Technology Base".

To elaborate this concept—the defence S&T base is the community of scientists and engineers, both inside and outside government, who have expertise in the development and exploitation of science and technology for military purposes. This base adds value for MoD in two distinct ways. The first is by carrying out research which generates technical results, new ideas, and inventions. These can lead directly to equipment that, for the time-being, gives us "the edge"—one of the most spectacular UK successes in recent years is thermal imaging, a battle-winning technology in which the UK still has a world lead.

The second and often less well recognised, feature of the S&T base is that it represents a body of technical staff who are used to working with the armed forces, who speak their language, who understand their problems, and who in emergencies can respond rapidly to technical problems.

Within MoD the role of these staff is to give MoD its intelligent customer capability whether it be in the very complicated process of writing performance specifications for new equipment or in ensuring that the delivered equipment properly meets them. These tasks are much more demanding than it appears and are ones in which in spite of best efforts mistakes can be made. This same group provides the scientists who support the services on active duty providing day to day technical advice to commanders and the staff who can devise and implement or procure "quick fixes" to meet urgent operational requirements.

The S&T base staff are virtually the only source of advice to which MoD can turn to evaluate the potential military significance of new civil technologies whether for incorporation in equipment for our own armed services or if deployed against them by others. An extension of this role is the evaluation of technical intelligence, an area perhaps meriting particular attention in a period of détente, when governments might reasonably wish to have the earliest possible warning of covert activities by others that could be the prelude to hostilities.

Staff on loan from the S&T base also form a large and essential part of the MoD Operational Analysis community whether within Defence Operational Analysis Centre, the DRA or the Commands. OA is an increasingly valuable tool both in making informed policy and deployment decisions and in judging system effectiveness in procurement.

Typically MoD scientists and engineers have alternated periods working at the bench in the research establishments with other S&T duties outside whether with the services, the Procurement Executive or the Central Scientific Staff. Their continuing involvement in research is essential for them to maintain their currency in science and technology; without involvements of this kind, technical people rapidly become stale (just as does an athlete who does not train or a pilot who does not fly) and their ability to add value to the range of other activities that depend on the S&T base, becomes rather small. The importance of this continuing involvement with the practical side of science and technology was recognised at the time the DRA was established when means were devised to ensure that the interchange of technical staff between the DRA and other parts of MoD was maintained.

By supporting research, therefore, MoD procures not only the results of the research itself, but also an essential technical capability which, although numerically small, can potentially provide a leverage on the whole defence programme quite out of proportion to its size. The growing technical sophistication of warfare suggests that the need for this leverage will not diminish.

Industry

Traditionally in the UK as in most of the western countries the defence S&T base has been located partly in industry and partly within the national defence research establishments, some of the functions of the defence S&T base being more appropriately discharged by one rather than the other. The balance is, however, likely to change.

Industry has conducted defence R&D partly on direct support from government and partly on private venture money. The latter expenditure is justified by the expectation of profits on future production runs. Today, however, prospects for production are fewer and companies are spending scarce discretionary funds on restructuring and down-sizing.

It is clear therefore that, in view of the world-wide over-capacity in defence-related industry, there will be significantly less incentive for industry to invest its own money in defence R&D without a clear advance commitment to subsequent production.

This leads to the conclusion that regardless of the overall level of support for R&D, and regardless of where the work is done (ie industry, DRA or elsewhere), in future the defence S&T base is likely to have to find a greater fraction of its support for government. The separate question of how the S&T base should be distributed between industry and the DRA, is of great importance but lies outside the scope of this paper.

Collaboration and the DRA

One possible way forward in the present circumstances is to examine the feasibility of further collaboration with others (international or within the UK) so that some of the costs of maintaining the defence S&T base can be shared. The DRA is the main agent of military research collaboration. In principle collaboration has much to commend it but there can be snags. Hard experience over the years has shown that collaborative arrangements have to be entered upon with a degree of circumspection if they are truly to save money and if ill-will and disagreement are not to overtake completely the enthusiasm with which the collaboration was originally begun. Often too, collaboration offers value enhancement rather than a reduction in cost.

Collaboration can be successful if the participants are equally committed to the project, can contribute similar value to it, have a clear identity of purpose, and have similar amounts to lose if it fails.

The down side is that because more than one customer is involved and because different organisations or countries have different ways of doing business, all bureaucratic procedures (eg those relating to intellectual property rights) take much longer and the projects are much harder to control. There is also a danger that one or more partners may withdraw before a project is complete, causing the others nugatory expenditure.

Collaboration that is well judged and carefully managed can reduce research costs but is unlikely to offer large savings in the foreseeable future. It is also unlikely to contribute significantly to the maintenance of the broader defence S&T base.

The future role of the defence S&T base:

The main driver for technological competition in defence used to be the super-power confrontation in Europe. That has now gone and the expenditure on new military technologies in the West is falling and in the East too has fallen away quite substantially. There, and elsewhere, military technologies still need to be watched but activity is expected to be less intense.

Thus although the pace of change is likely to be slower, it is evident from the complexity and capability of much modern military equipment that the defence S&T base will continue to be important. It is, however, clear that priorities will be rather different from in the past. At the very broadest level there may well be reduced effort in support of procurement simply because the number of procurements is likely to fall; if, however, the number of procurements does not fall, but only numbers procured, the effort required will not change.

On the other hand there could well be increased emphasis on technical intelligence and the avoidance of technological surprise. Surprise can come about either from the introduction of new systems by others, or from the development of effective counters to our own. This would involve a continuing programme of exploitation.

The avoidance of technological surprise may come to span a wider front than previously. In the past civil technology in many areas—but certainly not all—has lagged behind miltary; in the future the balance may well be the other way, and it will be essential to recognise early the military potential of new civil technologies. On the one hand they may pose a threat, and on the other they may offer us the basis of affordable military systems, particularly in the IT, communications and possibly sensors areas.

Life extension technologies, modular upgrades and ways of achieving higher availability are all likely to be given higher priority. Many of these activities may well be supported with technology demonstrator programmes in industry, jointly funded with MoD.

In comparing the UK with other countries, it must be recognised that the strategy that will be right for us as a medium-sized power with a particular range of interests may well be different from that appropriate for a super-power or even a medium-sized power with different interests. This means that we cannot uncritically follow the lead of others, or indeed expect them necessarily to have the technologies and capabilities that the UK might need.

The UK cannot do everything and we need to emphasise those areas where we can exploit our very considerable intellectual resources to give the maximum possible added military value. It is clear that priorities for the S&T base will change and subject to the caveats expressed above there will be a strong incentive to seek increased collaboration. In some cases, it may turn out to be most cost effective to trade our results in areas where we are strong for those of allies where we are weaker. Overall, however, demands on the S&T base are not likely to diminish. We have to aim for a position in which we retain some competence and experience across the whole range of technical areas in which our forces need to be supported; superimposed on this broad base of competence we should expect to find a limited number of peaks of UK excellence and concentrated effort in areas of exceptional national importance.

The question arises of how the level of military research expenditure—serving as it does as a proxy for the level of support for the defence S&T base, and thus the size of the DRA—should be determined. At present the research spend emerges from the internal MoD budgetary process of bidding by research procurers and a subsequent interleaving of their bids with those from other parts of MoD. On the one hand it is hard to see any alternative to this kind of process that would be compatible with the present management structure of MoD, but on the other it is evidently a rather artificial exercise to compare the value of a hypothetical piece of research with those of more tangible elements of the defence budget. During the Cold War when it was necessary for the West to counter the latest Soviet technology the need for our technological effort was clear. It did, however, carry in its wake the advice and support function of the S&T base which came as a free good and did not need to be separately identified. Thus although there remain practical reasons for continuing to support the S&T base through the funding of research, it is a practice that will become progressively more difficult if as seems likely procurement activity significantly declines.

Most, and possibly all, large companies pay considerable attention to their R&D spend. R&D budgets are a matter of report to the main board who in some cases specify a funding level based on strategic operating considerations. Interestingly it is the practice in Japanese companies to account for R&D not as an overhead but as a capital investment that adds to the net worth of the organisation, to be written down over a period of years. This is consistent with the idea of the defence S&T base as an asset that wastes unless it is maintained.

Conclusions

The funding of research by MoD in the DRA serves as a proxy for funding the broader defence S&T base which underpins broad aspects of defence capability and which in situations such as the Gulf War proved just as important as the narrowly defined research output.

Although MoD should support research or any S&T activity only if it adds value to defence capability, much of value of this work is long term and a long view must be taken. MoD's requirement for a sound R&D base is unlikely to decline but the effort and capability must be most strongly focused where it can produce the greatest effect.

The UK is a small country and approaches to defence technology that are appropriate to larger countries may not necessarily be appropriate for us. We do not have large resources and so we have to live by our wits. We can gain particular advantage from being technologically astute.

The DRA has seen a great deal of change in recent years and although much of it was both inevitable and desirable too much can prove unsettling and detrimental to activity for which continuity, experience and stability are of the highest importance. In my view the DRA should be allowed to operate under the present arrangements for a further period of at least five years to allow the full effect of recent changes to become clear.

Examination of Witness

SIR RONALD OXBURGH, KBE, FRS, called in and examined.

Chairman

519. Sir Ronald, thank you very much for joining us today. We are most grateful to you, and particularly so for the written evidence which you submitted a while ago and which we read with great interest. I think you have had a note of one or two questions which we might perhaps put to you, though of course, as you know very well, we may well stray from those questions. Is there anything you would like to add at this stage to what you have already told us, however, before we start running through some of these questions?

(*Sir Ronald Oxburgh*) My Lord Chairman, I think not. The only thing I have to add is that having been away for a while, the first time I saw these questions was in the car coming here, so you may perhaps have to excuse a little lack of preparation in their answer.

520. Thank you. I think it would be helpful if you reminded us of your earlier involvement with these matters, perhaps rather along the lines of question 1 which we submitted, where we reported that we had had two different views about the discussions which led up to the establishment of the Defence Research Agency. One view was that it should be a strong commercial organisation. The other—which perhaps came through rather later—was that there was a need to make sure that quality and continuity were not sacrificed. Would you like to comment on those two themes which must have been prominent during the discussions, and would you like to give us your views as to which predominated in the event?

A. I have to say, my Lord Chairman, that I do not recognise the antithesis which is there in question 1. I do recognise a very strong antithesis, but not that one. I do not see it as a distinction between being bold and being cautious. In so far as there *were* disagreements about the way ahead for defence research related activities and the setting up of the DRA, I think the fundamental disagreements concentrated on what one actually wanted defence science to do. I would say that there was one extreme which I think I would say was closer to your "be bold" side here, which I think took the view that the sole function of the defence research establishments was indeed to do research related to equipment procurement. The alternative view, which I certainly espoused, was that the role of science and technology in warfare was very much broader than that; that by supporting defence science you were partly supporting research which would lead to useful and implementable devices, and you were to a significant, and probably an equal extent, supporting an important technical capability which you wanted and had to have anyway, for the reasons which I think I outlined in my paper. I suppose that what I emphasised in the paper is this broader view which I believe it is important to take in defence science and technology, rather than a narrow one simply relating it to equipment procurement. That, I think, was the distinction. Whether you maintain this capability inside or outside the Civil Service is actually a secondary question. The important question to address is why you are doing it, what can you get out of it?

521. To follow up on that point, if we are to assume—as I am sure you would—that the wider view must clearly be a view which should have a lot of support, although procurement is an element of the customer base within MoD, would you like to comment on the split at the moment of customers within MoD? We have at the moment the Deputy Chief Scientific Adviser. I think you reminded us that about 8 per cent of the research spend comes under his remit. There is the Deputy Chief of Defence Staff (Systems), and then there is the work commissioned by the three procurement officers effectively. Would you like to comment on the split, in the light of what you have just told us?

A. I have no particular problem with the present split. You could argue that it was wrong by a few percent in this direction or that, but I think that the present split is as defensible as any. The important thing is that there be as close as one can achieve to a seamless robe which encompasses all three. To some extent the arrangements which we set up four years ago, which covered the interface between the Deputy Chief Scientific Adviser and DCDS(Systems), have worked extremely effectively, in that they have the same person responsible to them for the coordination of the programme; a single person at one level down reports to the DCDS(S) for the applied side and reports to the DCSA for the strategic side. He is the person, the Assistant Chief Scientific Adviser (Research), who in fact has the role of making sure that the robe is seamless in that area. That, I think, is one of the few bits of the system which has worked exceedingly well, and so I am not very much bothered whether strategic research is a few percent more or a few percent less. The important thing is that there should not be silly interface problems between the two. The interface between both of those and the work commissioned by the controllers is, of its nature, much more difficult, because the controllers are necessarily concerned with solving problems associated with particular projects, and the volume of that work has to go up and down, along with the nature of the projects which are being undertaken and the problems which are being encountered. So I think that that is a balance which one ought not to attempt to independently address. One can say that the latter amount is simply determined by the programme to which the MoD is already committed. The interface between that and the other work which is going on has to be managed within the DRA.

Lord Redesdale

522. You said on page 2 that there is an element of artificiality about the business arrangements for the DRA and that the value of the assets is both to a degree arbitrary and arguably too high. How far do you think that the viability of the DRA is threatened by its business arrangements?

A. Six months is a long time in this particular game and it is six months I have been out of it and so anything I say is subject to that caveat. At the time that the original valuations were done there was severe concern among the external—that is the industrial members of the DRA Board that comprised internal and external members—that the DRA were being put to too severe a test by the valuations that were employed which are to a degree artificial—how do you decide the value of a wind tunnel at Farnborough? It is not a saleable asset. Nobody would buy it. Is its value 30 pence or is its value what it costs you to put it up or to replace it today? That is what I mean by artificiality almost throughout the business plan.

523. So is there actually a link between the value of the assets and the research being done?

A. There has to be, because in a sense the return which the DRA is supposed to achieve is reflected in their prices, which in turn are reflected in the volume of research which MoD can actually afford to have done from the allocations in the defence budget.

524. Is this perhaps the reason why the figures for 1993 and 1991 drop from 870 million, given in the first framework document, to 197 million took place?

A. It may be, but I cannot comment on those figures in particular. I do not know how they are made up.

Lord Dainton

525. Sir Ronald, you said at one point that we need to know "why we are doing it and what we are trying to get out of it" is really the key background force in this particular field. Of course, one of the things we are trying to get out of this now that the defence is running down is to get the benefits of the knowledge that is within the Defence Research Agency out to what is valuable financially, as it were, through leading to more productive industry. This you say I think in your shorthand form, the italicised form, that the structures are really now very complicated and as I see them, but correct me if I am wrong, they are that in some areas at any rate the DRA is earning money by being itself a contractor for an industry and so one finds the curious situation of the money, as it were, coming in from the Government for one part of DRA's work, for this other part of the DRA work it is coming from industry to the DRA, and in a sense this seems to create a complication?

A. Yes, that is correct.

526. Do you regard it as disadvantageous, and, if so, what can you put in its place? You do say there are no supposed efficiency gains in this and if there were that would solve the problem, but you put it in a way which made me think you were sceptical about it?

A. I am sceptical of anything that you cannot measure.

527. Like virtue.

A. Like many things of that kind. This whole change, and this way of doing things, I think one would say is ideologically driven; that this was regarded as fundamentally a better and more secure way of doing things. And thought was not given at the time to say, "Well, how will we know whether it is a better way of doing things, whether this has saved money?" I think if that question had been asked it would have been hard to answer because you have got no control. One may contrast the present situation with that which existed before where you had research establishments that were free to talk to industry and basically trusted by industry. They worked in collaboration with industry across a whole gamut of projects, and I believe that at that time there was very significant research establishment/industry technology transfer which was never accounted for, and clearly it was in no one's particular interest to identify it. Obviously a company that had done something rather smart or intelligent did not want to say, "Well, it was not our idea at all, it came from this research establishment or that". Occasionally there were things involving intellectual property rights but that was rather rare; and the MoD establishments had a rather free and easy and totally unbusinesslike relationship with industry. The same sort of relationship can exist in other countries as well.

528. Would you say this industry benefited very much from that?

A. I think industry benefited from it. Again, it is very hard to quantify for the reasons that I mentioned. As soon as one puts the DRA on a businesslike basis so that it charges industry for what it does, in which it can compete with industry on a sub-contracting basis in some areas, clearly that free and easy interaction which involves no contracts, no exchange of money, cannot occur, and the presumption is that there are efficiency gains and that the Government will see financial benefits through licences for production and other benefits which they did not receive in the past, when information was passed across freely. These are two different ways of doing business and I do not think that anyone is actually in a position to say which is better.

529. But there are two different types of business as far as the DRA is concerned within industry, are there not?

A. Yes.

530. There is one in which it is wanting to collaborate for the common good and there is another in which it is putting itself as a competitor?

A. Yes, absolutely.

531. Can those bedfellows be accommodated in the same bed?

A. I think one has to recognise this can happen in industry and so the answer has to be yes.

Chairman

532. There is a third complication in that in some ways the DRA is acting as an assessor. That is also compatible, is it?

A. Yes.

Lord Dainton

533. Could one just follow this up and think of the future? The world is not static, it changes, and we have seen signs of change now and people looking to their defences again. How can the DRA maintain that balance of activity which makes its primary role of serving Government and the Ministry of Defence well served given that, as you said I think somewhere, the research establishment directors and so on and the director of the programmes of DRA always had this broader view?

A. I think the first thing that I have to say is that doing anything with defence research (and with a large number of other institutions which we all know about, whether they are universities or government departments) the time constant associated with any adjustment has to be related to the time scale of possible change in the organisation that you are dealing with. If one continually fiddles with the way one runs the DRA, it is like fiddling with the tiller of an oil tanker. One knows that the oil tanker takes a long time to come round. If you want to see the effect of one particular tiller change in the DRA you have to realise that it is going to take five years, six years, seven years; then if you do not like the result, that is the timescale on which you try to do something different. I think that if I had plenipotentiary in this matter at the moment I would try to do as little as possible with the DRA and simply see how it settles down under its new management style which I think is really working pretty well, not without hiccups, not without dangers, but probably working as well as could be expected; I would see how its relationship with industry developed and I would not do anything for quite a while. I know it is not a popular thing to say "do nothing" but that is in fact what I would do under these circumstances and try to maintain a reasonable level of funding. I think it is less important what that level of funding is, but that there be a degree of continuity so that there can be long-term planning.

534. You seem to be saying that good people will make any system work.

A. That is what I believe.

Lord Renwick

535. Can I follow Sir Ronald up on what he is saying, which is, in effect, give them time? In your evidence to us on page 3 you do say, in your first paragraph, that "This"—which I think is the competition, or potential competition, between the DRA and industry—"has made it more difficult for the DRA to give MoD advice based on a comprehensive technical oversight of what is being done in the United Kingdom as a whole." Could you comment on the rating you give that?

A. I think it is *quite* serious, but I do not see any way of changing it, given that we have gone to the new method of doing business. However, I think it is quite serious. There are things that you can do about it but you can work much harder at interactions with industry. When I say that you can work much harder, though, may I contrast the old days and speak informally. In the old days it was very easy for research establishment scientists or engineers; they had got their clearances, they could basically go and knock on the door informally of big defence contractors, there were no questions asked; they could go in and talk to the people. It was just a very easy, informal way of doing business, and you picked up all sorts of bits of information which you put at the back of your mind. Subsequently, a problem might come up, so you would say, "Oh yes, they were doing this or that in that area. Let's ask them, they may be able to help". That is incompatible with this much more formal way of doing business. You can do something about it but you now have to be much more formal. You have to programme your visits in advance and say what you wish to talk about and then meetings are set up formally. You can work harder and get less for it. However, I think we can get some way there.

536. We have had the evidence from the Gulf War that it is the side, as it were, with the very latest technology which wins, have we not?

A. Yes.

537. The speed of technological change is so fast now. Is not it much more important even than it used to be in the good old days, as you were saying, for someone advising the MoD to have a total picture of the very latest in technology? Does the present system allow that?

A. Let us take a realistic view of this. The DRA is very important, the research establishments are very important, but they do not have a monopoly on world military technology. If one is talking about the spectrum of defence technologies which must be available to a modern fighting force that is liable to be involved in high-intensity warfare, the DRA can be world experts in perhaps—these are arbitrary numbers—20 per cent, at most, of the areas in which one is interested. They can have a competence and a working knowledge of many others, but we are inevitably dependent on a large number of other organisations, particularly in the United States, in France, in Germany and so on, where it has to be said our scientists would not have had the kind of free and easy interchange that they had with our own defence contractors. So the loss which you quite rightly identify has to be seen against this broader panoply.

Baroness Hilton of Eggardon

538. If we can pursue the international theme, you mention in your evidence to us the ending of the Cold War and suggest that there is therefore over-capacity in the defence industry worldwide. One's impression from reading the papers, of course, is that there has been a proliferation—small-scale perhaps, but a proliferation—of conventional wars throughout the world. I wonder whether the last six months have perhaps changed your mind on that and what you see as the implications for the defence industry in this country, and whether we have over-capacity or not?

A. I hate to make predictions way outside my field of expertise. You have to make some sort of guess, however, at the kind of world scenario for which you are preparing. You cannot have a defence policy, you cannot have a procurement policy, unless you do. What is clear is that the Armageddon scenario which we might say we were in until the end of the Cold War, in which you had two Goliaths bashing away at each other, with enormous numbers of heavy pieces of various kinds and a great deal of deployed high technology, has receded. I think that one thing most

[Baroness Hilton of Eggardon *contd.*]

people would agree on is that that scenario has receded; and it would be hard to see it coming about again within the next 20 years, just given the time it takes to build such Goliaths. No one can say what China will be in 20 years' time, or what any country will be in 20 years' time.

539. Or the Ukraine.

A. Yes. There is that sort of time window, and within that time window I suspect that we will be much more concerned with very unpleasant, difficult and hazardous, smaller-scale operations of the kind we see in Bosnia—maybe Vietnams, things of that kind. When you talk of "Vietnams" you talk of blurring the distinction between something which is local and quasi-guerrilla related and something which is much larger scale. Within that scenario I do believe that our equipment requirements, the associated technological backup and the broader technological backup are likely to be different from those of the Cold War. In a world where you have fewer forces, the important thing is to make them very potent, as potent as you possibly can, but above all to have them in the right place at the right time, and that generally means early. That in turn implies that you must have exceedingly good sensors and exceedingly good intelligence. So I see no reduction in our need for a whole range of sensing technologies. I personally believe that one of the strategic errors which this country has made, for a variety of reasons, is effectively pulling out a number of years ago from space observation. Within Europe we have left this field to the French who have exploited it to the full. It is clear, however, that when we couple space observation with the data managing—manipulation—filtering-power of high-speed modern computers, the capabilities are quite astonishing; and countries which have assured access to space-based information and assets are going to be at a tremendous advantage. They may not necessarily have to maintain very large forces, because they can have the forces which they *have*, where they need them, at the right time, and essentially be ahead of the game. I think it is fairly common knowledge that in some respects the Gulf War was quite an eye-opener for the Americans, because they did not really have their space-based assets quite together at that time, and their exploitation of space-based assets then was much less than it could have been. This was because in essence they tried to manage the output of 1990s space technology with ground-handling procedures which were related to the 1970s and 1980s, with piles of air photographs and men trying to go through them, sort them and find things on them. For that reason, our own Tornado-based reconnaissance at that time proved quite invaluable, because—as Lord Craig could tell you much better than I can—that really plugged a hole which should not have been open had they really had their act together on space. They will not make that mistake again, and that is going to be a tremendous plus. Of course, the Soviet Union—sorry, I should not say "the Soviet Union"—Russia are maintaining their space efforts to a significant extent, and it looks as if they, France and the United States will be the three large groups maintaining these extremely important sensing technologies. I see that as a big shift in the way that I would manage defence science and technology for the new scenario. I could rabbit on about this for hours if you wanted, but is that the kind of flavour that you are looking for?

540. It is absolutely fascinating, yes. Is it too late for us to get involved in it? What incentives are there for our defence industry to continue if we are so far behind?

A. Everyone says it is too late, but what you have to remember is that the first Ariane rocket was launched after men had walked on the moon. You could easily from a French point of view have said it was too late then, but one ought to be under no illusions, this is an expensive game to get into and, if you like, this touches on another area of almost what I might say is national schizophrenia. Are we to have a coherent and self-contained national defence force along with its supporting science and technology capability, or are we part of a much larger scenario in which we are totally and utterly and irrevocably in bed with a group of allies. Frankly, we will not really get much sense on the defence science area until we can reconcile ourselves to a conclusion on this broader question which, of course, has ramifications far outside defence science.

541. It is not a question of supplying our own defence industry and our own national needs for defence because it is a commercial organisation that sells arms all over the world. Do you think there are still incentives for the rest of the defence industry to pursue that or have we lost out on that too?

A. Most of the things that you are prepared to sell round the world are not the kind of things that we are talking about here for the next generation of sensors.

542. Fairly basic.

A. Yes.

543. Thank you very much.

A. What is basic changes continuously. The other theme I am trying to get across is that the benchmark is continually shifting and that you can stay up with the game only by continuing to run.

Lord Howie of Troon

544. This extremely interesting reply brings me back to Lord Renwick's earlier question which related to the different ways of giving a comprehensive technical oversight and I think you suggested that DRA could expect to be truly expert in something like 20 per cent of the procurement. I know that is just a figure. It looks to me that if things go on as they are proposed to go on that 20 per cent would tend to reduce.

A. I would imagine so.

545. And that the comprehensive technical oversight would become not less and less, but be less. I do not think "inoptimum" is a word but it is an optimum point perhaps. Do you not see this as an extremely serious disadvantage in the new arrangement and a disadvantage which might not be counter-balanced by the anticipated commercial successes?

A. If there are commercial successes they will obviously help, no question. Yes, it is a major

[Lord Howie of Troon *contd.*]

disadvantage. There is a point of view which I espouse but which is not wildly held which is that if one takes one's defence assets as a whole, whether they are science or technical assets, whether they are aircraft, tanks you name it, and you should say, "All right, we are in a period of relative détente at the moment and in which we can to an extent dine militarily à la carte." It is our decision whether to send troops to Bosnia or not. It would be our decision to send troops to this remote part of the world in support of the United Nations somewhere else or not. The actual threats to the United Kingdom base, to the United Kingdom are really very limited indeed. Under those circumstances what one could do is say, yes, when we are going to maintain specialist capabilities and I include technical and military, to meet several scenarios and we will be glad to play our part and try to do our bit in those scenarios, but for other scenarios we will have to say, no, others have to do that. In an ideal world one would adopt a posture like this, not necessarily totally in concert with allies but certainly with a degree of mutual information and there are areas in which in fact informally we have done this, in some ways in the past. Once you have said that, you then say, "Well, in the long-term we may have to regenerate, the whole world may change on the 20 years' timescale", which may have to come back to a much higher level of armament commitment to other things that we hope or expect but which may have to happen, in which case you look at your various defence capabilities and try to associate with each a regeneration time. How long does it take to regenerate, for example, a squadron of Tornados or a squadron of EFA or what have you? What are the time constraints in each of these and then you plan a broad peacetime or détente strategy under which you maintain at a relatively higher level than in war time, and I say relatively, those items which take a long time to regenerate; and under that broad strategy I would say that we were unwise to simply scale down our technical capability at present to the same degree and at the same rate as if you like our military teeth because the military teeth in many cases will regenerate and can be regenerated faster than the longer-term capabilities that I am talking of there. There are a whole range of other capabilities outside science and outside military teeth which you actually have, which have intermediate and associated timescales, but I believe that that has to be your strategy. This is a very discursive way of answering your question but I actually believe that we would be wrong to scale down things in the DRA to the extent that looks as if it will happen.

546. It seems to go back to your policy of doing nothing.

A. Well, in a sense, yes.

Lord Craig of Radley

547. Sir Ronald, following on from what you have just been saying, you argue that in future the defence S&T base is likely to have to rely more on government funding rather than less because with defence industries retracting, there will be less incentive for commercial applications in this area. That then leads on to putting greater pressure, if anything, on the defence scientific staff who are advising on the areas in which work should be done because, being government funds, it has got to be justified that much more. Would you like to say anything about the arrangements there? Do you feel that there is some way they could be strengthened? It is all about arguing about eight per cent or whatever, but that is not the issue. The issue is how do you get sufficient government interest in this area to spend the money?

A. I have been arguing in favour of the intrinsic importance of a technical research base in which I believe very strongly. I also believe that the way in which we have managed defence science in this country for decades has been culpable. For one reason or another, and I am not really the person to explain it, traditionally we have put walls and high fences round our defence research establishments. We have not promoted very close interaction between the wider technical community and the military technical community. As some unkind people said to us outside the barbed wire, the wire was there to keep the ideas out. I think that is very unfair but it was something that often used to be said in academia from where I came. This really very strong division between the civil scientific and technical community and the military one is something which is not true in North America. There, for generations, you have had a much easier interchange between the military and the civil scientific communities, which has had a technically beneficial effect; it has meant that ideas have actually flowed, which was a good thing. It has had the effect of giving the military technical people a much higher profile, a much higher prestige than they have tended to enjoy in this country, because people knew what they were doing; they knew that they were doing sensible and good work which was scientifically respectable. So little has been known by the outside scientific community of what went on within our research establishments that certainly long before the time that I had anything to do with them everyone outside regarded them with great suspicion and said, "They're a bunch of scientific mediocrities doing things which probably aren't very useful and probably giving the military people bad advice". That was untrue, but it was a view which was not uncommon in the non-military technical world outside. So one of the things I would do—and in fact when I was in my job I tried, relatively unsuccessfully to do this—is to promote a much closer interaction between the broader scientific technical community and the defence research establishments. I believe that that actually should now be part of our policy. To a degree, that is now written into the DRA mission statement (I cannot remember what they call it). I think that that is terribly important. Getting rid of that wall goes quite a long way towards giving it the kind of profile which makes it politically easier to support this activity, because greater knowledge of it would probably give it a greater support from bodies such as your own here. The fact that you are having to hold this enquiry itself says something. So if I were able to change one thing alone, I think that would be the most important. In terms of internal arrangements within MoD, I probably would not make any profound changes to those which are there

[Lord Craig of Radley *contd.*]

at present. I would again give them time to work. They may be shown to have serious deficiencies in the longer term, but they have not been in place long enough really for the operational problems which are associated with any new system to get worked out. So I probably would not change them very much for the time being. I am terribly conservative, I am sorry!

548. Following up that very interesting response, are you advocating instead of the DRA a national research agency?

A. Not particularly. I do not think it matters what you call it.

549. No, but what I mean by that is if you call it a defence research agency it is a creature of MoD, it belongs to the Secretary of State for Defence, it is there to do business for him. If there is a spin-off for something else, well and good, but it does not, for example, bring in the Road Research Laboratory or something else which is outside, which is DTI or somebody else sponsored. Should they all be pooled together? If you were to say yes to that—I am not sure that you would, but if you were—you are suggesting then that the DRA should not be left alone for a while, which I think earlier on you felt was the right thing to do. What would your answer be?

A. The answer is that I would not bring them together. I think the DRA is a big enough problem to manage. I would probably change its name from the Defence Research Agency.

Baroness Platt of Writtle

550. To what?

A. I would need notice of that particular question! I may give you an answer by the end, if I have had a bright idea in the meantime.

Lord Craig of Radley

551. The national something?

A. To give you an answer, something like the Laurence Livermore Laboratories, or the Los Alamos Laboratories. They are able to take on work in a whole range of other areas as well. The name of Los Alamos is, for example, a name synonymous with *the* centre for high-performance super-computing in the United States. That is where the very best work goes on. It is something which the military are interested in for all sorts of very good reasons, but it is something which is of enormous importance outside as well. I would like us to have a defence research agency which became *the* national centre for certain kinds of activities which were very important to the MoD, but which were very important to the rest of the country as well, achieving a synergy between national and defence objectives. I believe this could be done in space, for example.

Baroness Platt of Writtle

552. We heard that this happens in America, that there is much more responsibility for seeing what you mentioned earlier, maintaining a national technical capability, because if you lose a technical capability it is much more difficult to set it up again, is it not?

A. That is right.

553. One does wonder whether that statement about the duties of the DRA ought to be widened to include wealth creation so that it thinks more widely than defence. That is why I asked you what would you call it. Obviously not "Los Alamos", but it does seem that this may be the thing which needs to happen to change the balance, which may not be a revolutionary change, but which would alter trend.

A. Wealth creation is making money, and they are supposed to make money already, so in a sense it would not.

554. No, I meant not just making money for DRA; I was talking about wealth creation for UK Limited, the OST point of view.

A. Yes, how could one change the remit of the DRA? I would say that one would encourage them to expand into areas of joint civil and military interest and seek to take on civil work in those areas which could amplify and maintain their capability in the broader sense as a national asset.

555. Might that not put out of business, though, industrial companies who are already doing it? How do you reconcile the collaboration and the competition in that particular area, if you are thinking of UK Limited?

A. I go back to the United States for analogies. If one looks at the way that Los Alamos works on super-computing, they have things called CRADs (Cooperative Research Agreements for Defence), or something of that kind. It is a special initiative in which the United States Government I think has put aside about $150 million for joint initiatives between the government research establishments and industry, by which industry put in matching funds to an initiative which has broad interest to the establishment. As far as I remember, Los Alamos is now getting in something of the order of $50 million a year in joint industry/government research establishment initiatives. These tend not to be near-market; they tend to be longer-term blue skies. The broad answer to your question is that I would see the DRA developing these pinnacles of expertise in areas which were probably not particularly close to the market, and it is only when you are very close to the market that severe industrial competition problems come in. I see them as being of considerable interest to industry, and I would see industry supporting them in the same way as they support initiatives in universities and things of that kind. We are now speaking against my own institution! It is certainly not in *our* interest to see money going in that way.

Lord Renwick

556. Sir Ronald, I want to go back to your answer to Lord Craig when you mentioned the mission statement of DRA. The important question is, can DRA achieve its mission statement under its present structure?

A. Subject to the financial caveats which we have already talked about at the beginning, provided the finances do not become so barmy as a result of changes that might have taken place in the last six months or what have you, I think they probably can. Whether they fulfil them all to the extent that we were talking about a moment ago with Baroness Platt is a

[Lord Renwick *contd.*]

different matter. I think they probably can, but many of these elements are not there in a quantified way. You can certainly do something towards all of them, but whether they would meet all our expectations fully is a different matter.

Baroness Hilton of Eggardon

557. I wondered, using your Los Alamos analogy, whether you thought the DRA should be a cluster of centres of excellence, each one of which developing a separate identity, collaboration with local universities or whatever and becoming a centre for particular expertise?

A. I would not have a problem with that at all. It would be a very sensible way to go.

Lord Howie of Troon

558. The discussion just lately seems to me to have taken a somewhat expansionist tone. That worries me a bit because industrial bankruptcies are as often caused by over-expansion as by other reasons. I would like to come back to something rather smaller and that is to relate the DRA to civil industry. There is a problem there and that is that the DRA is entirely owned by the MoD and is accountable to it. I wonder whether the MoD is the best Ministry to be involved in civil markets. Military ones, I dare say, but civil ones I wonder about. Do you think it would be possible to have arrangements in which the DRA were accountable not only to the MoD but perhaps to the DTI?

A. If you are doing it, if you are having a DRA in order to provide a unique and essential support service to the military, that is why you have the DRA and that is what your main purpose has to be and that is what your line of accountability has to be. I remember Mrs Thatcher once saying, "The important thing in Government is not to have muddled objectives" and I think if you have a DRA which is trying to serve two masters equally you probably end up satisfying neither. I think provided you accept the general thesis that I was advancing at the beginning, that technical support is of the greatest importance, that it is essential as long as we want to remain a serious military power, then that support has to be the responsibility of the Secretary of State for Defence. You can then set up an arrangement by which it is highly advantageous and profitable and attractive to the DRA to do all the other sorts of good things that we have talked about, but I do not think myself that you could reasonably have it answering two ways.

559. No, I am inclined to agree with you, but it seems to me to raise a major difficulty, that is, since you cannot answer to an industrial department and are obliged to answer to the Ministry of Defence, does not it weaken very greatly the possibility of serving a civil market?

A. In a way I believe that criticism would have much more weight with the old research establishments where the establishments were answering in a direct way to the MoD. That is not really the case any more. What you have is a freestanding trading fund the Chief Executive of which has various responsibilities. He has to balance his books and he has got to make a return. In other words, you have an organisation there which is responsible for its overall performance to the Secretary of State but not for the details on how that performance is achieved and I believe that it is entirely possible to use conventional commercial contracts of a variety of kinds to give an organisation which responds to those sort of incentives the right sort of push to let it do any of the things about which we have talked. If, for example, let us take Aldermaston as an example (it is outside the DRA but it is a very important defence research establishment) they have enormous computational need. We were talking of Los Alamos a moment ago. On the present budgetary provision, when I looked at these things, it looked to me as if Aldermaston were going to have the most enormous difficulty maintaining capability in computing and in a number of other areas which were rather important if we want to stay in the nuclear field. If we have a machinery in place by which they can take on work in the computing area which has civil application (let us say we are talking of massively parallel computational systems which is the big growth area in computation) there would be great industrial interest in this country in developing expertise in that area. It does not actually much matter where it is done. It is something that we are pushing at Imperial College. I would have thought, and in fact I so advised, that Aldermaston should try very hard to promote the civil applications of this kind of work. Weather forecasting, for example. All of the big global forecasting models are incredibly voracious of computing capacity at the moment and are going to make great demand on these massively parallel computers, but this type of computing is at the moment in its infancy and there are real opportunities there. I do not see why in the DRA (and I believe there are comparable areas for the DRA to get into) that should not happen, perfectly naturally if the opportunities outside are there. It would really be to the advantage of the DRA to do civil work because it would allow them to maintain more mass in their centres of expertise than they could conceivably do on military funds alone.

560. I am not sure whether the MoD is the right group to initiate this sort of thing and to encourage it. We were told, do you remember, Lord Chairman, at an earlier stage of a man in the DTI who was on the telephone every day to Malvern asking questions, I dare say, or giving advice. What part do you think the DTI actually play in this element of encouragement and initiation, if any?

A. Can I just clarify, you said there was someone on the phone daily to Malvern failing to get a question answered, I presume or having difficulty with Malvern?

Lord Howie of Troon] I do not know what they were doing. Can anybody remember?

Baroness Hilton of Eggardon

561. He was giving us an example of how close the collaboration was.

A. I thought you were saying that he could not get questions answered.

Lord Howie of Troon

562. This was in the line of business.

A. I see the DTI as a totally sensible customer for the DRA to take on joint initiatives. Probably the most significant largely unsung DTI/Research Establishment joint initiative has been in aero engines. This country is a world leader in aero engines and that simply would not have been the case had there not been massive joint MoD/DTI funding. Technology demonstrators bring in a certain amount of Rolls Royce money as well but really DTI were the big players in that game along with MoD in developing the facilities at Pyestock and supporting the research at Pyestock. You do not actually see that advertised anywhere as one of our great national achievements, but it is a significant achievement for Rolls Royce to be in there along with the two big American players. That is a beautiful example of how the DTI and other establishments can work together and there is absolutely no reason why that should not happen in other identified areas.

Baroness Platt of Writtle

563. Actually on the Met. Office side, the Met. Office is anyway financed by MoD, is it not?

A. It is part of MoD.

564. Yes, so it ought to be possible to do that?

A. Yes.

Lord Craig of Radley

565. Following up what Sir Ronald was saying there, the analogy of the Rolls-Royce/DRA relationship, which we have had put to us, and we totally accept it because it is with a monopoly supplier not a research agency. It is not so easy to do it when there is more than one potential supplier. I do not know if you have any suggestions as to how that can be dealt with?

A. It is difficult, and this causes embarrassment at Los Alamos. The only answer is "With difficulty". I do not think there is a general answer. I would actually be quite thrilled to find an area in which this country had two potential world players who wanted to do things together with the DRA. It is difficult.

Chairman

566. Sir Ronald, could I take you back to one very important theme which you have left with us (and very helpful I might say it has been). You have told us that in terms of accountability it is helpful and probably important ultimately to be responsible to one department. You have also suggested that it would be important to develop pinnacles of expertise which preferably should not be too close to the market. You have demonstrated that close links of the DTI with the MoD and the DRA have in fact proved effective. You have also identified areas which you feel that the DRA could well be moving into, not just for the benefit ultimately of a national resource helpful to defence, but also to other sectors of defence. Given all that—which I think is all quite understandable, and I myself find it extremely helpful—whose responsibility do you think it is to move the DRA into these areas where you think there might be a symbiotic relationship?

A. I think it is probably the case that the machinery is in place at the moment to allow the DRA to respond to initiatives of this kind from outside. On the other hand, I believe that the central scientific staff within MoD and the DCDS(Systems) part of that staff have a significant role to play interacting with the DTI and acting in a midwife capacity to promote initiatives of this kind. Certainly this was the kind of thing which I was trying to do in that job. I think there is an important catalysing or lubricating role. My people by and large—at least, they were my people—do not have the money to initiate big projects, but it is their job to try to get people round a table talking about these things and to see what the mutual benefits are. So I see the scientific staff within the MoD as having a responsibility here. I also believe that the scientific staff within the DTI could well have an important role to play. I used to meet fairly frequently with my opposite number in the DTI. OST is a relative newcomer on the scene. It was there in my time, but not really as a fully developed entity. I believe that OST has an important role to play here too.

Chairman: We shall ask Professor Stewart when we see him next month. Sir Ronald, we have kept you a very long time. You have been extremely helpful to us. We have drawn most interesting answers from you, and I am sure we shall reflect very fully on what you have told us today. Thank you very much indeed for your evidence.

THURSDAY 24 MARCH 1994

Present:

Chorley, L.	Platt of Writtle, B.
Craig of Radley, L.	Renwick, L.
Hilton of Eggardon, B.	Selborne, E. (Chairman)
Howie of Troon, L.	

Memorandum from Sir Ronald Mason KCB FRS

1.1 The DRA has become administratively independent of MOD as a result of its operation under a trading fund. It is however very dependent on MOD for about 80 per cent of its funding. The MOD in turn is critically dependent on the DRA for a continuing level of high quality advice. Commercial organisations with such a high level of inter-dependency would seek to merge to reduce operational costs through the administrative effectiveness so gained.

1.2 DRA's status as a trading fund is a hindrance in its pursuit of its role as provider of the highest quality research. Too much emphasis has been placed on the evolution of new management processes to satisfy the customer/contractor interface against ensuring the continuity of an effective research base.

The nature of the customer/contractor interface has resulted in the need to measure progress by the transfer of the knowledge base resident within the establishments to the relevant programme offices which are the budget holders. This has led to considerable duplication of effort. At its most basic level, the work involved in running the outward looking interface from MOD is paralleled by the effort put into organising a similar interface within DRA. The interface is too cumbersome and too slow to react to changing requirements. The cost (both financial and in loss of experienced staff from research teams) associated with setting up such an interface has been grossly underestimated.

The customer/contractor relationship is also driving a perceived need to meet the quality standard BS 5750 which is resulting in considerable inefficiency and will be no guarantee of any further improvement in research quality. Indeed, BS 5750 is at the best only likely to guarantee the timely delivery of research of modest standards. The discipline inherent in BS 5750 and other so-called total quality management processes (TQM) are too rigid to benefit organisations at the forefront of advanced technology. The procedures are too bureaucratic and too cumbersome to take account of the evolving priorities inherent in innovative research programmes. Several of the world's leading manufacturing companies have recognised that whilst TQM may be of benefit in a production environment, its value in research is dubious. Many such companies (eg Sharp) are already examining other strategies to ensure the level of advancement that they seek in order to avoid the pedestrian progress otherwise likely to ensue.

The need to maintain its current position is also driving the DRA to invest considerable effort in marketing its "product" to MOD. As the MOD "market" declines it is to compensate for this by winning other business on a broader front. This is likely to lead to the redeployment of some 100 or so of its best research scientists as technical sales executives during the coming years, so reducing its capacity for maintaining its position at the cutting-edge of technology.

1.3 DRA is starting to focus its research strategy more towards meeting near term objectives. It is becoming more difficult to protect certain areas of strategic enabling technology, especially at times when pressure on the defence budget is giving the MOD customer no time to consider the implications of reducing funding levels in key areas of need. Valuable intellectual and capital assets are at risk. The drive towards creating a greater level of visibility and accountability to the customer is resulting in the division of strategic areas of research into separate Assignments, thereby significantly adding to the administrative overhead. In the Quality Assurance area, some activities are subdivided into 300 or so separate tasks, with programme values of as little as £500 each. Some of the important aspects of Quality Assurance have been reduced to a "jobbing shop" activity.

Processes of competition are also being considered on an intra-mural basis on the assumption that this will lead to improved efficiency and performance. Such procedures are divisive and counter-productive to processes of collaboration and cross-fertilisation that are of paramount importance in any research organisation at the leading edge of technology.

The current DRA corporate structure has been founded on a strategy which is unsuitable for the evolution of a successful research organisation. Difficulties with operating an Engineering Services Division as a separate profit centre have already become apparent, and have resulted in the loss of manpower, expertise and capital facilities that may be impossible to replace.

1.5 DRA's new status is making it more difficult for MOD to gain access to expert, impartial advice. Its role as an honest broker is being eroded as more and more applied research is opened to competition. The same is true in its interactions with other Government Departments. Private industry is becoming increasingly more concerned about DRA's role as a potential competitor, rather than seeking the level of partnership essential to the future evolution of technology to the benefit of wealth creation.

1.6 With the demise of the FSU, the likelihood of sporadic regional conflict has increased. The FSU[1] are finding ready markets for their surplus equipment driven by their struggle to gain economic stability. Increasingly, advanced weapons are also emerging in other regions as a result of commercial sales by Western organisations. The need to apply new technologies to maintain a competitive edge over potential adversaries will become an important strategy for the future. In some cases, a rapid response will be required to deal with such emerging threats, which would be difficult given the current bureaucracy associated with the MOD/DRA interface. Similar arguments apply in the cases of the continual battle against terrorism.

1.7 The former research establishments were not so much providers of a research service, but the source of much of the expertise upon which the MOD and the Armed Services based decisions for future procurement. Since the Establishments and the MOD were all part of the same organic organisation, there was no barrier to transfer of knowledge and advice. As needs arose, OR branches could communicate directly with experienced groups within the establishments and at times of conflict could re-focus work programmes to address critical issues with the minimum of administrative effort.

2.1 DRA's planned restructuring and rationalisation measures will certainly affect excellence. Some of the arguments relating to the introduction of total quality processes have already been highlighted in the comments on 1.2 above. There is clear distinction between the meaning of "Quality" inherent in high quality research and the so-called "total quality" sought in some management processes.

2.2 The pace of rationalisation has been set as a consequence of the formation of the DRA and the implications associated with its financial discipline. Guidelines for treatment of capital assets have resulted in an artificial representation of the true cost of running the business. Had the Research Establishments been left within MOD there would have been no problems related to asset valuation. In many cases, the costs associated with setting up the facilities had been met in previous budget years and were of a non-recurring nature. Associated consultancy and accounting costs would also have been avoided.

2.3 The morale of staff in the DRA is at an all time low. The ablest research scientists should be motivated by the work that they carry out, rather less so by the financial rewards associated with their high level of performance. The establishments have for many years operated at the technical cutting edge—this attracted some of the best young scientists that Britain has produced, in the knowledge that they would be working in an "intellectually stimulating environment, with unique access to the results of research within industry and in many cases, that provided by other governments".

The environment created within the Establishments ensured the retention of the best staff—the recent changes have seriously damaged this environment at a time when the need for exploitation of advanced technology as the basis for wealth creation is paramount.

2.4 The concept of allowing private companies to gain access to and seek alignment with defence research activities (as under Pathfinder) is not new. For example, in the electronics area, RSRE played the leading role in fostering the advancement of UK industry in these critical areas of technology. Industry were slow to match the level of investment and were reluctant to take the risk of exploiting opportunity offered by expansion into civil markets. The situation is no different at the present time. Companies will only invest in technologies where there is clear evidence of pay-off in a few years. Even at the peak of the JOERS programme, where the MOD research establishments played a major role in supporting the DTI initiative, companies did not take advantage of the opportunity afforded.

UK companies are at a disadvantage compared with their Japanese counterparts. They have to return a large proportion of their profit margin to their shareholders, significantly providing less capital for reinvestment (eg for research and new product development) than is typical in Japan.

2.5 DRA should identify future defence needs through consultation with MOD or branches and relevant sections of the Armed Forces. A close relationship is essential—DRA scientists will have a good understanding of the technical feasibility of future equipment and defensive systems.

3.1 Civilian spin-off should be a major concern for defence research. As commercial markets emerge, they will necessarily drive the advancement of techology. The defence customer will benefit from being able to "run with the tide", gaining a considerable leverage from the level of investment made.

3.2 There are no clear recipes for the successful transfer of technology from the defence to civil sector. Organisations such as DTE have failed, partly because of the hesitancy of venture capitalists to risk the prolonged incubation period between the time of product inception to its eventual demonstration. Japanese organisations have been successful in the exploitation of high technology largely because of their ability to take a long term view. Potential new products are assessed some 15-20 years in advance of public release and plans put in place to research technology likely to be required for their realisation. Winners are established, unsuccesful technologies are dropped. The approach is successful partly because of a fundamental difference in the Japanese view of high technology and also because a greater emphasis is placed on a concerned effort involving government, industry and academia.

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[1] i.e., the Former Soviet Union

3.6 The DRA has a broad overview of the capabilities of industry, arising from its collaboration on funded programmes of work. In some cases the DRA may recognise the potential for forming partnerships between seemingly disparate parts of industry, which otherwise may not have been considered.

3.8 It is often assumed that the process of market-testing will reduce the cost of providing high quality research. Industry is good at manufacturing products and should not be encouraged to compete with DRA purely as a means of reducing the cost to MOD of carrying out a particular task. Some companies often submit bids on a loss-leader basis, knowing that they can increase the limits of liability at a subsequent time by negotiating a change in requirements or detail of specification. Emphasis should be on the continued development of partnerships with industry, rather than enhancing the level of competition. There are already too many examples of failed programmes and over-run costs, and of claims arising from penalty clauses in procurement contracts as a result of work undertaken by inexperienced organisations. The costs of litigation outweigh any cost benefit arising from the initial competition.

3.10 DRA considers European collaboration as a matter of course through programmes such as EUCLID, EUREKA and through organisations such as ESA and NATO.

3.11 The former MOD research establishments were looked upon as models for other nations to follow. Staff within US DOD laboratories frequently commented on the efficiency of the UK organisation. The US are plagued with a bureaucratic system that is relatively inefficient and prone to duplication of activities.

A tri-service initiative was introduced in the US in 1991 to realise substantial improvements in defence science and technology management and efficiency, and to reduce redundancy, replication of effort and costs. Following the more recent Clinton initiative, increased emphasis is being placed on cooperative research (industry, government, academia), technical insertion and transfer, centres of excellence, provision of domestic materials sources, conversion and dual use, military superiority and environmental acceptability. The Defence and National Laboratories are expected to form a focus for such activity, channelling funding from ARPA. The importance of enabling technology has been recognised, with increased emphasis on materials, manufacturing and processing as the essential basis for achieving international competitiveness.

In France, research is well-coordinated by government, with some work carried out at government funded laboratories. Industry is also provided with a significant level of national funding, which allows companies to maintain a strong technological position. This has resulted in the successful follow-through in certain areas of work, despite a slow start, in comparison with the UK.

Germany has invested less than the UK in defence related research at a strategic level and is not seen as front-runner in its ability to address the diversity of issues typical of DRA's business. Like the USA, it benefits from a strong industrial base which has developed a strong position in certain areas of activity (eg electronics and avionic systems).

Australia has recently re-organised its Defence Science and Technology Organisation, centred on its three major establishments. Planned reductions to achieve cuts in expenditure will result in manpower cuts of some 25 per cent over the next three of four years. Cuts will be taken mainly in administrative and support areas. Much effort has been made to identify future requirements and to focus the DSTO programme on these needs to ensure that DSTO innovations with potential outside the Defence arena are nurtured, and an Industry Support Office has been formed within DSTO. Australia recognised the importance of advanced technology in wealth creation some time ago and was at the fore-front of the setting up of cooperative research centres. It also examined the feasibility of setting up a system by which government matched industry's investment in selected areas of activity. Some lessons could be learned by examining the Australian model, although the comparison with the UK must be made with care due to relative differences in the size of the two economies, and the differences in the size of the two economies, and the differences in defence theatres.

In Canada, defence priorities are aligned with NATO and continental partnerships with the USA. Important roles are played in international peacekeeping operations, arms control verification and humanitarian assistance. Defence research is centred on three establishments. It is foreseen that research and development will suffer cut-backs in personnel by about 18 per cent over the next eight years. As a result, in some areas only advice and little, if any, developments activity will be carried out. Infrastructure overheads are a target, but are politically unacceptable at present. Increased levels of dependency are likely on international collaborative programmes.

Examination of Witness

SIR RONALD MASON, KCB FRS, called in and examined.

Chairman

567. Good morning. Thank you for joining us this morning. We are most grateful to you for helping us in our deliberations on the Defence Research Agency. Is there anything you would like to say by way of introduction before we start on some of the questions?

(*Sir Ronald Mason*) My Lord Chairman, thank you for the opportunity to appear before the Sub-Committee this morning. I might offer some brief remarks. My submission to the Sub-Committee, my Lord Chairman, and perhaps those of others, has as a central theme the workings of the customer/contractor principle in government. It is, I may remind you, 24 years since Lord Rothschild gave us what is really a management tool. I reviewed its workings some nine years ago and came to the conclusion that successful examples of the workings of the Rothschild principle were few and far between. There was a valuable debate, my Lord Chairman, on the subject in this House eight or so years ago, the content of which, in my judgment, stands up today. I say this because we could all agree, I believe, on one or two essential requirements for a successful customer/contractor relationship. The first is that the customer should be informed, indeed intelligent; the second is that there must be a dialogue between the purchaser and provider which is roughly symmetrical. The Ministry of Defence, I submit, was just about the only qualifier in that regard. For much of the scientific and technological infrastructure of the executive departments have been significantly or, indeed, totally reduced since the Rothschild review. Many of my comments on the Defence Research Agency therefore, my Lord Chairman, stem from judgments of how its institution and evolution has affected the quality of advice given to requirement staff in the Ministry. I believe the detachment, as it were, of the DRA from the Ministry of Defence has introduced an unnecessary and, indeed, an undesirable gap in the requirements process. It is affecting MoD's research capabilities, particularly the so-called strategic research activities, at a time when I hope we could all agree that there is an increasing need for flexible responses to those new challenges to our security. Thank you, my Lord Chairman.

568. Thank you very much. Clearly, from what you have said now and put in your written evidence, you feel that the whole status of the DRA as a trading fund has been more of a hindrance than a help in providing the service to the MoD which is required of it, which is to provide a source of expertise in advising the Ministry of Defence on their procurement requirements. Is that correct?

A. My Lord Chairman, "hindrance" may perhaps be a strong word on a bright morning, but that essentially is my feeling. It is the introduction of a longer element to the chain processes which we know as the "requirement stage". There are other defects, I think, in its evolution but, yes, a hindrance perhaps.

569. Those who have submitted evidence to us who have favoured the new status of a trading fund for DRA have tended to say they believe it imposes essential discipline to the running of research establishments, whether they are a large organisation, such as the DRA, or whether they are a smaller more discrete organisation. I think there is a widespread view, given the difficult climate under which defence research funding all around the world is clearly having to operate, that the need for these financial disciplines and other management disciplines are greater now than ever before. Do you feel that is valid, or do you feel that the solution of trading fund status misses the point?

A. I certainly believe, my Lord Chairman, that there is need for discipline. I would agree with you that the need for that has sharpened over the last few years. The need for scientific discipline, if I may call it that, has always been present in terms of the customer, that is of the Armed Forces, and in terms of reviewing authorities of one kind or another, either within the old controllerate or, indeed, for example by an independent advisory board, the Defence Science Advisory Council. The discipline on the science and the technology (and that is not to say one was complacent) was always present. I believe clearly that there is always need to review what financial/fiscal instruments you have in place and whether they are adequate; but it does seem to me if I may say so, my Lord Chairman, that if in a sense you are saying defence R&D internationally has to come under pressure, perhaps indeed has to be diminished in absolute scale, then I think the question I would beg is whether in fact the DRA (which is a rather generic tool for this discipline which you describe) is the right approach in bringing new priorities into the system. Let me be hypothetical for a moment. Let me just say arbitrarily (and ministers are entitled to a certain degree of arbitrariness) that ministers had said to the Ministry of Defence that we could either only afford that much money or afford to maintain that many scientific staff: what do you believe, in terms of security challenges, defence policies for this country, in relation to the growing capabilities we find in the defence industries and find internationally, that we could cope with? What would I do? I would submit, my Lord Chairman, what I would do would be to merge with the unique capabilities that do belong in those establishments that we call the DRA. I would not, for example, my Lord Chairman, be concerned with protecting, say, discrete technologies, excellent though they may be, in the defence establishment. I would see no reason to defend materials technology activities, in Farnborough let us say. My concern, which gets sharper and sharper by the day, would be for those unique capabilities which are in the establishments—systems engineering, systems design, systems analysis and systems integration. That is something which is very, very difficult to find in this country in industry. That is the kind of privatisation I would be looking for, my Lord

[Chairman *contd.*]

Chairman. The discipline would not necessarily be simply at the scientific, nor indeed the fiscal level, although those are necessary tools to have; but I would prioritise and I would maintain those capabilities which I believe are uniquely placed in government establishments.

Lord Renwick

570. Can I ask Sir Ronald whether the current status, the trading fund status, precludes the DRA from maintaining those priorities? Did I understand you to say that?

A. I do not think I would want to go as far as that, Lord Renwick, no. I think you find basically that the activities of the DRA (and I said that in my submission) are turning, first of all, towards short-term results, and in terms of the spectrum of activities I would put it no more strongly than there is a considerable element of salami slicing in which systems expertise has not been preferentially preserved.

571. The implication of this?

A. The implication, I believe, is that our systems integration capabilities—our ability to hang things together for complex defence systems and with requirements changing rapidly—those are less good today than they were five years ago.

572. And the implications as far as national security is concerned?

A. The effect as far as national security is concerned is that I think we will see slippage in the procurement of major systems, such as communications, command and control.

Chairman

573. Is this a consequence of failure to identify the correct priorities, or a consequence of the failure to put the right mechanisms in place?

A. I am not sure I can answer that, my Lord Chairman. I think because I am a little unclear in my mind, with respect, that those are really separate. The mechanisms, so to speak, follow from the priorities, do they not?

574. They might do. It might be priorities could have been determined adequately whatever the mechanism was; it may be because the mechanisms were inadequate it was impossible thereafter to determine the priorities effectively?

A. My position would be today that the way in which priorities have emerged is inadequate, and that therefore whatever one does with the mechanisms is probably a fairly imperfect elastoplast for the lack of sensibly formulated priorities.

Lord Chorley

575. But it does not, does it, follow that the trading fund mechanism is the source of the weaknesses which have been developing which you have described?

A. I cannot think that is right in this sense, Lord Chorley. We have seen the problems I have announced in general, that is an increasing lack of intelligence as a customer on the part of executive departments. That has emerged in departments without the institution of a trading fund. I think in a sense the trading fund perhaps has magnified that, but I do not think the emergence of the trading fund is a fundamental cause of it.

Lord Howie of Troon

576. Looking at the very long paragraph 1.2 in your submission, it strikes me that you detect a gap between management and research here, putting it very crudely. Two points I would like to ask. You say too much emphasis has been placed on the evolution of new management processes. The first question is, is that perhaps a temporary effect which would balance itself out as DRA settles down? Secondly, further down you seem to me to pour some fairly cool water on BS 5750 and something which you refer to as total quality management processes. Do you think that concentration on BS 5750 and TQM has diverted the energies of the DRA away from research into management organisation?

A. Lord Howie, if you recall at a slightly later stage in some of the questions the secretary sent me, there is the issue as to whether BS 5750, total quality management, is appropriate, and I have signalled that I know of many industrial organisations which are increasingly finding that BS 5750 and TQM to not be of the highest relevance in monitoring their research activities. In other words, there is a capability, a process, called research which is not (and that is not my judgment although I can sign up for it) amenable to BS 5750. My position on that would be, and it is related to the Lord Chairman's remarks earlier, there is need for monitoring, there is need to satisfy yourself about research quality, indeed about research relevance. There is an allusion in the papers to what is going on in the civil sector, in our universities, namely the grading of research, capabilities in the various departments of our universities, done by the Higher Education Council, by what is a peer review system. The peer review system exists in the Ministry of Defence, we have for example the Defence Science Advisory Council and we have external consultants. I hope I am not being complacent by saying if you believe the process which is operating in universities today is right, that could be mimicked very easily beyond BS 5750 in a more intelligent way. Yes, as you say, there is this concern of mine which again I touched upon in my opening remarks about a further step, a further gap, being put into the requirements process. It was the case that the requirements staff in the Ministry of Defence could, at the very outset of the project, bring in first-hand technical advice. Now they have to set up a situation in which they have project and programme leaders, the rapport has to be made first of all as it were in the first phase with those who are very often establishment colleagues on secondment to the Ministry of Defence. So there is that process. Then, having got to that process, they now need to go out to the establishment for further advice, there is a long contractual discussion about that, and so I see the whole thing having been elongated very, very considerably, at a time when I think there is a clear need for foreshortening the requirements process.

[Lord Howie of Troon *contd.*]

577. But you do not think that when the new managerial structures settle down that that gap might close? Or do you think it would harden?

A. I frankly hope it will. Clearly all of us would hope it will. It would be silly for us to predict that the DRA cannot work in a way which I think would represent an improvement on the present situation. I would hope so. I would only say, in a slightly flippant way, that like the Irishman I would not start here.

Chairman

578. Looking at DRA and its relationship with Government in one manifestation or another, I wonder whether you would like to comment on the role of DTI insofar as it collaborates with the MoD, successfully or otherwise?

A. Yes, my Lord Chairman, and let me do so from the position of a (slight) insider because for 2½ years until this time last year I was chairman of the Engineering Technology Committee of the DTI, and was concerned in the technology transfer and innovation scene. One of the main products of that Committee was so-called carrier technology, which is all about technology diffusion, and of best practice from one sector to another sector in our industry. A member of that Committee was the Deputy Chief Scientific Adviser of the Ministry of Defence, so I was very conscious of the need to be transparent, if I may use those words, between the DTI and MoD. I have to say, Chairman, that I do not see significant progress, significant developments, in the relationship between the DTI and MoD nor of defence technology being transferred to some advantage or another into the civil sector. I think there are a number of reasons for this, not least of which of course is that after the White Paper on Science and Technology the role of the DTI in sponsoring technology research and development has diminished very significantly, indeed you may say it has disappeared. So that I am not seeing significant developments. I am not for one moment wanting to say that is a criticism of DRA because if you go back, as I did in my paper, to the deliberate attempt to embrace DTI technology and MoD technology, namely our response in the early 1980s to the Japanese Fifth Generation IT Programme, that my Lord Chairman I would submit was not very successful. I make that as an observation, not as a criticism but there was at the time a clear national determination to create a major information technology industry in this country, and that I submit has not been the case, that has not worked. I do believe, and I have mentioned this in my notes, there are reasons for defence technology transfer not working at all well historically, not least of which is the good deal of risk aversion which we see in the sectors of industry which might be most able to pick up defence technology. But to answer your question rather shortly, I confess to being very disappointed by the present strategies, if I may use that word, of the DRA and I see no clear evidence that what in a sense was attempted also in DTI is working. I might say, my Lord Chairman, that I think there is a real sense in which we are asking the wrong question. The question, so far as defence is concerned at the moment, it is not really of principal concern that technology should be transferred out of the defence sector into the civil sector. It is actually in terms of cost, in terms of performance and so on, the issue of taking what is happening in the civil sector and adapting that, hopefully at minimum cost, to defence requirements. That is the case, *a fortiori*, in information technology. MoD has not led, DoD has not led in information technologies for a very, very long time indeed. In fact, essentially what we should have is not, in shorthand, MoD push, if you like, on DTI, but what should be happening is more MoD pull on DTI!

Chairman] That leads me neatly into the whole area of DRA and industry and inter-relationships.

Lord Craig of Radley

579. Picking up particularly your typically robust written evidence and following on from your evidence about spin-off and spin-in, you say that the DRA should be particularly concerned with spin-off to the civilian sector. In its framework document DRA is constrained very much to responding to the customer's needs, in other words the Ministry of Defence needs primarily. From what you have been saying before, I wonder whether you feel that the framework document is not right, and that it should be more permissive towards working into a civilian sector or indeed drawing from the civilian sector?

A. Lord Craig, I am certain that you are better informed than I of the increasing problem of dealing with dual technologies, be it in the context of proliferation of weapons, or be it in the context of discussion today, which is that essentially there are major opportunities for the Ministry of Defence to pull in those developments in civil technology of real interest and concern for them. The framework document it seems to me, and I hope I am not being unjust, does not have integral to its thinking the sheer vital concern for exploitation, for diffusion and so on and so forth of dual technologies. The fact of the matter is that increasingly less and less can we say, "That is defence; that is the civil sector". Therefore, any doctrine that essentially tries to put Chinese walls between them has to be wrong. It has to be wrong because in fact the other side of the argument is that we can see with real effect that Chinese walls cannot be put up between defence and civil applications for certain technologies. Hence the problems of certain export controls.

580. Are you then finding fault, as it were, with the Ministry of Defence perception here, bearing in mind it is Ministry of Defence money which constitutionally they are required to spend in the defence sector? Is it therefore a fault within the way in which money voted by Parliament is being used that you think is the constraint here?

A. I do believe fundamentally that the Treasury rules, which are what the Ministry of Defence are implementing, are myopic in not recognising the real changes happening in technology across the world.

Baroness Platt of Writtle

581. In what way are the Treasury rules myopic?

A. In the sense that Lord Craig just mentioned, effectively you are saying that what technology you

[Baroness Platt of Writtle *contd.*]

should develop, research into and implement and so on and so forth, that must be directly related to a well defined defence requirement.

582. With insufficient flexibility, you mean?

A. Absolutely. The point I am making of course is that if you look at things—and let us talk about communications and information technology as a whole, the defence requirement is there, the civil requirement is already ahead. There is a sense in which you are almost forbidden from looking at some of those civil technologies, those dual technologies, so there is little flexibility; at least, the interpretation is one of little flexibility.

583. Really the framework document of DRA ought to include more emphasis on the civil spin-off, for the Treasury to accept that as a complementary aim?

A. Absolutely. I was trying to get at the issue in the round. As Lord Craig said, the spin-off and the spin-in, there is almost a feeling of polarisation. The point we are trying to make is that what we are interested in is that middle area where the spin-in and spin-off come together, where there is flexibility, where there generally are not only dual use technologies but dual use—surveillance, for example.

Lord Howie of Troon

584. I have always tended to think of spin-off as being slightly accidental, desirable but slightly accidental. You seem to be suggesting that spin-off should really be an aim, and then you go on to say in paragraph 3.6, "... the DRA may recognise the potential for forming partnerships between [what you describe as] seemingly disparate parts of the industry ..." Would you really expect the kind of people who are likely to be in DRA to be able to do that? These partnerships seem to me to require a kind of entrepreneurial zeal which is not always to be found; it is not always to be found anywhere, let alone the DRA?

A. I was not going as far, my Lord, as what I might call the entrepreneurial activity, although I can see there is a sense in which my words might have hinted at that. I think what I was actually hinting at in those remarks was what I touched upon earlier, and that is, essentially one of the fundamental capabilities which I believe belongs to the DRA establishments is that of systems integration, systems engineering. When I talk about the disparate industries, I am really reflecting on the fact that, for example, a complex weapon system, an intelligent weapon system, is an integration of an enormously disparate and varied set of technologies. The systems man can look therefore beyond a particular industry which is concerned with microelectronics, and a particular industry that is concerned with mechanical engineering, and a particular firm that is concerned with manufacturing, and can see in his systems approach how these should be knitted together. That is what I was after in those remarks. Clearly, there is a sense in which, when you are in systems engineering terms, there is a entrepreneurial element; but I was actually looking more specifically at what I would call the capability of integration when I was making those remarks. On your earlier remark—if we look back at spin-on, accidental, haphazard indeed—even liquid crystals, which is a superb example, more than recognised that. RSRE recognised it, and recognised it perhaps even then, for its defence applications rather than for its wristwatch applications or general display applications. They recognised that, developed it, and took it to British industry and, as you know, it fell through the cracks. I suppose it is now a good ten years since the Ministry of Defence actually did have a specific aim, a specific policy for targeting spin-off, for the experiment that was DTE was just that. The Ministry of Defence said, "We want to exploit defence technologies. We want to have moles (as they were called) in our establishments to see what technology is applicable". DTE failed, perhaps honourably, as I think I have indicated in my notes, on the grounds that there were not enough industries around and not even venture capital which could accept the risk of adapting and developing. It is not novel to DRA, although DRA clearly has got a policy for encouraging, identifying and making spin-offs happen.

Lord Howie of Troon] In fairness, I must say when we went to Malvern and had liquid crystals explained to us, the chap who did it seemed to me to be infused with a certain amount of entrepreneurial zeal.

Baroness Hilton of Eggardon] Too late!

Chairman] And of course his partner, Professor Hilsum, had left Malvern in order to go and implement that precisely in industry, had he not?

Lord Howie of Troon] Quite.

Lord Craig of Radley

585. Can I touch on the impact of the new competitive approach of the DRA and market testing and so on? Do you feel this has affected DRA's relationship with industry?

A. I ought to say first of all that the Sub-Committee could be forgiven if they believe I am being somewhat anecdotal in my evidence today. My anecdotes in terms of the submission were based on talking to about 20 DRA staff and what I am now about to say comes from discussion with some dozen or so industrialists at a significant level of seniority. They have, I think, two concerns, as I see it, and I think it goes beyond just the sheer element of competitiveness. If it be the case that we want to move more development (and perhaps research also) into industry, which is a declared aim, then what are we doing at the same time changing the portfolio of R&D activity in the DRA towards the shorter term objectives? If there is a clear case for transfer into industry then surely that is of short-term research, that research, that development which industry is being expected to implement in the reasonably short term. Therefore basically the structures which encourage, determine, that short term be done in the DRA seem to me to be illogical. Our industry is saying that and I think that is a justified view which goes beyond the element of competitiveness. The other view which I think is fair is that our highly qualified scientists are spending more and more time putting proposals up in competition and this undoubtedly is affecting the quality and the volume of the activity in the DRA establishments. Ultimately, I think, the concern of industry would be

[Lord Craig of Radley *contd.*]

that if in fact, as I am arguing, strategic research is being affected in the DRA establishments, it is not going to be more than two or three years before this is reflected in terms of what we can or cannot do in terms of defence programmes.

586. You do not think that this is a feature of old dogs learning new tricks, if I can put it that way, in that this is a novel experience for the DRA personnel but once they have learnt to master it, it will be very much more routine than it is at the moment?

A. I think there must be a human element to all this, obviously, but I would say that although you will hear some in industry saying, "We can do systems engineering, we are systems engineers, and we are independent of the software systems analysts" and so on and so forth, the bottom line at the end of the day is that there is no explicit general challenge to the fact that it is a fundamental of activity in the establishments. There is a genuine concern at the moment that that systems expertise is being reduced and that industry will have to reflect on that position in several years' time.

Baroness Hilton of Eggardon

587. I think you have dealt already with the thrust of the short-term research which the new arrangements are creating in the DRA, are you also saying there is a lack of strategic over-view by the MoD about what shape the DRA should be in, and what the main thrust of their activity should be, and the whole function of the research in DRA?

A. Lord Craig charged me with offering some robust evidence to you, and I am very tempted to say—but I must be rather careful! If we do not have a strategic plan for defence R&D I think the next examination question you must go to is, do we have a strategic view of new defence policy requirements? I think it would be sensible for me to beg that question today, would it not? I have to believe, I must believe, that the research and development activity must flow naturally from defence requirements for the most part, with the kinds of caveats I was using about dual technologies, and it must flow from defence policy.

588. So you are really saying we should be having a proper defence review first?

A. I think it would be a review with a little "R", in other words perhaps it ought to be more intellectual than political.

Chairman

589. You referred earlier to the fact the priorities have not successfully been determined, and we discussed to what that might be attributed, but clearly one attribution could well be that there is not a clear view, a consensus view, within Government on strategic defence requirements, and how on earth could there be successful priorities determined one could ask?

A. I believe there is a linear relationship between policy and programmes. I do believe that priorities are not present and a strategic plan is not present for programmes in the context of research and development. I believe that is a reflection, perhaps if one wants to be charitable, of the fact that defence policies are more dynamic today than they have been for a very long time. Perhaps one is trying to deal with an extremely difficult, if not impossible, job, but that is my position. But there has to be a direct relationship between policy, programmes and research and development.

Baroness Platt of Writtle

590. You have expressed concern about the morale of the staff in the DRA due to the fast transition to trading status, could you give examples of that?

A. I said earlier that a good deal of my evidence is judgmental, is perhaps anecdotal. The statement I made is based on meeting a fairly large number of the scientists I keep in contact with. The charge is, and it goes perhaps to the heart of your question, that they would say that so to speak, wouldn't they, when faced with change, as all of us do. The charge is that they were not informed, consulted, involved in the change; that essentially there was a degree of imposition and a lack of dialogue which left them having to manage at the margin. That I believe, if I am right and as I say it is a statistical statement, is responsible for the present low level of morale around the countryside.

591. Do you think consultation is happening now as a result? All of us have been involved in these reorganisations and there is no doubt morale does drop during the period of uncertainty, but presumably they are beginning to come through that now?

A. I do not have any evidence. I would hope that is right. Wearing another hat I am involved in the National Health Service today, and what I am very, very clear about is that the kind of consultation which goes on there, has been and I think is absent in the relationships between senior DRA management and the establishments.

592. If I could go on to your answer to question 3.11, you have given some interesting suggestions from other countries but you are rather dismissive of the USA. Some of our witnesses have felt the mix that you talked about earlier between civil and defence has been achieved to a certain extent through the Advance Research Projects Agency and the fact they do have a directive to make sure the US industry can still exist to serve both the defence and the civil field? Do you feel something like that might answer your weak system you were talking about earlier?

A. I am actually a very great admirer of DARPA. As you know, reflecting on its new remit, DARPA has become ARPA. At the moment in Washington you might call it the only show in town in terms of actually funding strategic longer term research and development. I know it at first hand: I am a consultant to an American company concerned with counterproliferation which, as you know, is at the centre of the stage of United States defence policy. ARPA is doing some splendid work and it is very conscious to narrow the gap between the civil and defence sectors. This was of deep direct personal interest to William Perry before he became Secretary of Defense when he was still at Stanford, and a lot of the momentum is due to his initiatives and now with ARPA. It is extremely successful and, yes, I wish we had something like that.

Chairman

593. Could you also draw any further conclusions from Australia; you referred to that in your evidence?

A. Yes, I did and I also entered some caveats. They do have rather different problems and do have questions of scale and so on and so forth. I had my tongue slightly in my cheek when I made those remarks to this extent: I think Australia for 20 or 30 years has been advocating a build-up of high technology industries, and it has always puzzled me as to why they have never got there. In the 1960s and 1970s they brought in multinational organisations; they often died on the vine; but that last attempt seems to me to be very significant indeed. They have re-vamped the DSTOs; they have focused it down to three organisations; they have focused the programmes. You might say, in relation to our earlier discussion, that Australia has a clearer definition of security policy today than ten years ago. I think I could be reasonably optimistic about that. As far as I am concerned, perhaps the major emphasis there is the emphasis I put in my response to Baroness Platt and that is, they have focused, they have a single agency for thinking strategically about future requirements.

Lord Renwick

594. My Lord Chairman, could I ask Sir Ronald to expand on that. He certainly has considerable criticism, I believe he would agree, of the present status of the DRA. I think you have identified in your last answer a single entity with objectives, which are self-explanatory. Could you elaborate on how you think the situation either should have emerged from the old DRA (you said that the change was imposed upon it, and I think we all agree there), either should have happened, or perhaps could even happen now to achieve the ideal which you have just explained on the American instance?

A. It goes back to our discussions on the priorities, and what you want of these research and development programmes. If I may be slightly historic: in 1980 two of us, myself as the Chief Scientific Adviser, and the then Deputy Chief of the Defence Staff were asked separately to say to the Chiefs of Staff and the Ministry of Defence: what is the bottom line in terms of what crucially we must have as strategic capabilities? My response was 'softer' than the Deputy Chief of the Defence Staff, and perhaps you might expect that as a lobbyist for science and technology. To illustrate it, the then Deputy Chief of the Defence Staff said there were only three capabilities that had to be fundamentally protected: nuclear weapons, which is self-evident if we are to continue in the business; electronic warfare; and cryptography. For the rest, we would go and buy aeroplanes from America or go and buy warships from Germany or whatever. Therefore, a proliferation of R&D across the board to maintain a broad industrial base of strategic capability, of reactive capability, was not vital. I took a less narrow view. For example, at that time I took the view that development in armour for tanks was a strategic capability and, therefore, I wanted to retain materials technology at a high level. I doubt whether I would say that today. What I am really saying in short is that fundamental question: what do we want in these days of changing defence policy, in these days of changing mobility and reactivity; what do we want for an equilibrium security policy? I do not know that that question is being examined in the form as it applies, or should apply, to the Defence Research Agency.

595. I did not quite hear your third requirement. There was nuclear and electronic and—

A. Cryptography, being able to talk securely one to the other.

Lord Chorley

596. That is why you say in 1.7 that the important thing is not so much providing a research service, but a source of expertise across the board so you can pick up the changes and what is coming forward?

A. I did remove myself from your remark "across the board". When I talk advice my bottom line would be of systems capabilities.

597. Just that?

A. If I really were pushed into a corner—there are some technologies and to be specific, leaving nuclear weapons aside, there are things like opto-electronics, laser damage weapons where it would be very difficult to walk into University X and say, "Please tell me what's going on". There are some discrete technologies that are worth arguing should be present, but the fundamental capability would remain systems engineering.

Chairman

598. To be able to advise in an expert way on systems you have to master discrete technologies which contribute to the systems?

A. To a point, my Lord Chairman. To move it away from defence for a moment, take for example that very successful systems integrating company Electronic Data Systems in the United States. There is very, very little inhouse expertise in technology. They are the suppliers, as you know, of information systems across the board and are very large and very successful. I do believe though that that position has certain short-term implications. I believe you have to have access to discrete technologies, but that access is not in general difficult to come by.

599. At the end of the day the ability of one organisation, albeit something of the size of DRA, to cover expertise in all the requirements that the MoD might have I think we recognise is likely to be more and more limited. To what extent is it possible for DRA to keep an expertise insofar as offering advice is required, without having the research capacity in that area?

A. Surely, my Lord Chairman, you are venturing on to issues such as collaboration with the United States, within Europe and so on and so forth. When we embark on a collaborative process we are talking about merging, integrating complementary activities. The fact is that nationally, clearly, we cannot maintain across the board expertise, can we? Our contribution to the international technology pool is 8 per cent, something like that. Very clearly what we have got to believe is that we have judgmental expertise which will allow us as a nation to dip into the international pool in terms of defence or other requirements and take, as it were, rather

[Chairman *contd.*]

crudely, what we need. We cannot afford to have it all but what we have got to do is somehow maintain a broad base, and I believe you do maintain that if you have viable systems capabilities. What we do have to maintain is that judgmental capability at a systems level, not necessarily hands-on discrete technologies capability.

600. Are there any further questions which any member of the Committee would like to put to Sir Ronald while we have the chance? Sir Ronald, we have kept you for quite a while, thank you very much for the wide review you have given us on the issue we are trying to address. Thank you for your help.

A. My Lord Chairman, it has been a pleasure to be with you and your colleagues.

Memorandum from the Federation of the Electronics Industry

1. INTRODUCTION

The Federation of the Electronics Industry, FEI, represents 236 member companies with an annual turnover of £65 billion. The member companies are major providers of capital equipment, systems and components to the military telecommunications, information technology, defence electronics, aerospace and maritime sectors. The FEI companies sell in the global market and their exports are a major contributor to the wealth of the nation. Dealing as they do in front-edge technology, our members' life blood is research and thus the health and efficiency of the Defence Research Agency is of prime importance to them.

Over the years, a good working relationship developed between the Research Establishments and Industry. This relationship is now being translated satisfactorily into the new DRA organisation.

This relationship needs to be fostered. The DRA advises MoD on the strategic direction of the research programme and is the prime agent for that research. Collaboration with Industry in supplying the necessary results of that research is vital, providing as it does a service to Industry which, because of time-scales, cost or facilities it cannot afford to do itself. In addition, it is Industry that provides the design and manufacturing expertise needed to bring about the practical implementation of research results.

In this context the FEI members are of the opinion that the well established Joint DRA/Industry Research Consultative Committees provide an important interface at the detailed technical level and one which complements the Pathfinder process.

2. SUMMARY

Summary of responses to questions posed:

(a) The DRA is dependent upon the MoD for both its research funding and direction.

(b) There is the possibility that the new matrix management system may result in a dilution in the quality of the research undertaken.

(c) The relationship between the DRA and Industry is still in the early stages of settling down. Uncertainties regarding competition and IPR still exist and are, to an extent, hindering frank exchanges between the DRA and Industry.

(d) Surge capacity in times of conflict requires the development of an industrial policy that encompasses DRA capability.

(e) There is a danger that rationalisation carried out too quickly could affect efficiency and quality.

(f) It is too early to pass judgement upon the Pathfinder initiative. However, experience so far indicates that for it to be successful the process requires streamlining and Industry needs to be given greater visibility of the research planning process. Pathfinder must not be assumed to replace the traditional interfaces between the DRA Sectors and Industry.

(g) The DRA is poorly placed to assess the market value of any civil element of a dual use technology. The MoD customer for defence research accepts no responsibility for the health of the UK industrial base and as a consequence would only acknowledge civil spin-off as a by-product. Industry should determine the importance and applicability of any civil application of a dual use technology.

3. CONCLUSION

The FEI would like to thank the Science & Technology Committee for the opportunity to give evidence on the Defence Research Agency. As one of the UK's successful business sectors, the defence electronics industry should not be left entirely to the effects of the recessionary world trade situation and a decreasing defence budget. We would welcome HMG's co-operation in bringing about greater industrial involvement in setting future defence research priorities.

1. The Defence Research Agency and its Relationship with the MoD

1. *How independent of the MoD is the DRA?*

Not at all, as MoD provides the bulk of the DRA's funding and has to approve the content of the research packages; the DRA is therefore fully dependent upon the MoD. The DRA has no independent funds, equivalent to Industry's Private Venture Funding, and thus is unable to carry out research not agreed with MoD within its applied or strategic research framework.

1.2 *Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

The trading fund status of the DRA imposes an essential discipline to the running of a research establishment efficiency and with appropriate management objectives. However, the concept of "best quality research" is difficult to define and it may be found that the excessive imposition of financial constraints will result in a gradual reduction in quality. Many of the best research scientists in the DRA are currently preoccupied with "business planning" and are becoming frustrated at the lack of time for creative thinking. There is a further danger that the DRA's relationship with Industry would suffer from the DRA becoming more inward looking. Industry would be less aware of the overall research requirements and thus prevented from offering innovative solutions.

It is debatable whether some of the significant inventions made by the predecessors of the DRA would have been made under the current market driven research regime.

1.3 *How does the DRA's status affect its research strategy?*

The DRA's research strategy is now entirely constrained by the MoD's requirements. While the new management regime introduced by the Trading Fund status will make the DRA more cost conscious, there is concern in Industry that it will result in the DRA being more prone to take short term decisions, particularly on major facilities support.

1.4 *How has the MoD's system of Research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading Fund Status?*

No comment.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

There is unlikely to be a significant change in the DRA/MoD relationship; DRA will continue to promote the view that they are an impartial provider of R&D crucial to the national interest. They will remain as the only UK R&D operation to get any significant advantage from the "special relationship" with the US, as the US DoD still perceives them to be an institution of the state.

The DRA's relationship with private industry is still uncertain. The DRA is now competing with private industry for R&D funds, but is also appointed by MoD to monitor progress on MoD funded development within industry. This gives DRA visibility of the best of industry's development efforts and it is in a unique position to capitalise on them. Whilst industry is having to compete with DRA for MoD R&D contracts, it will be reluctant to share pre-bid information and research with DRA. In general, DRA is being seen more as a competitor than as a collaborator and the level of trust is low. The DRA has a remit to communicate research requirements to Industry, but is very wary of any joint DRA/Industry involvement with the MoD.

Industry may also be viewed as a threat by the DRA, through the imposition of secondary competition for applied research. This will obviously not help to provide close technical relationships between Industry and the DRA.

The formation of an agency has created a situation where former MoD staff responsible for creating policy and providing services are now themselves contractors to the MoD. As an example, the DRA is now contracted to provide Professional Component Services (PCS). Private Industry is obliged to use the PCS under DEF CON 17 and DEF STAN 59-36.

Much of the work of the PCS in Parts Control is of marginal usefulness to Industry including Qualified Parts List and Part 60/70 specifications.

The DRA are intending to re-write DEF CON 17 and DEF STAN 59-36. Industry is concerned to know who will ensure that policies are created to serve the interests of the MoD and Industry and not the DRA.

1.6 *How is the process of formulating a stategy for the DRA being affected by the new thinking about defence and foreign policy following the end of the Cold War?*

No Comment.

1.7 *The DRA, like its predecessor organisations, has as its primary role the provision of research services to the MoD. In the past, however, the defence research establishment have also provided other (non-research) scientific and technical services to the MoD (significantly so during the Falklands and Gulf conflicts) as well as to other Government departments and private customers. How far should the DRA continue to provide such services, and to whom?*

The DRA has been able to provide specialist assistance in times of conflict because it has maintained teams of experts in appropriate areas. Whilst Industry can often provide similar services, this cannot be relied upon. Industry will only retain teams of experts if there is a financial justification for doing so. If the MoD requires *assured* scientific and technical services support during times of crisis then it must develop an industrial policy on these matters; part of that policy must involve DRA.

2. The DRA's Management, Internal Affairs and Corporate Strategy

2.1 *Will planned re-structuring and rationalisation affect excellence, or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?*

There is scope for rationalisation; however, one problem with any attempt to rationalise by combining areas and sharing the resultant work amongst a smaller group is that of loss of experience. Done hastily, such rationalisation programmes can look good superficially in the short term, but harm the long term performance because of the loss of background experience.

An example of Industry's difficulty is in the area of performance testing of radars type approval, in particular the delay in preparation of the post test certification.

The DRA is in a monopoly position in having the only National Measurement Accreditation Service (NAMAS) accredited range in the UK and being specified as the testing authority by DoT.

The effect on one company has been exposure to considerable extra expenditure in pursuing individual national type approval in EC countries and a delay and consequential financial losses in concluding contracts in non-EC countries who would accept DoT certification when awarded.

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting-up of the agency?*

The pace of rationalisation appears to be fast in comparison with organisation structure changes that take place within Industry, and is likely to harm the long term performance of the DRA.

2.3 *What are the implications of the new regime's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?*

No comment.

2.4 *Pathfinder is the DRA's programme to allow private companies to gain access to research at a much earlier stage and to contribute ideas which align with their in-company, possibly civil, research programmes. The projected advantages of Pathfinder include more value for money by prevention of duplication of research and improving take-up of promising ideas, and providing companies with the earliest opportunity to develop their ideas thus improving their wealth-creating potential. Is the programme worthwhile? If so, does it need refining and how can it be improved?*

It is, as yet, too early to pronounce on the value of the Pathfinder programme, it has yet to complete the first cycle and let contracts. Experience so far indicates that the process requires streamlining and the visibility given to Industry of the research planning process needs to be improved.

If Pathfinder is to be of any value then it needs to be organised in a way which allows much more openness of defence needs and greater involvement of Industry in the determination of cost effective and innovative responses to those needs. If industry is, in effect, to be asked to carry part of the cost burden of defence research then it needs to be able to carry out realistic and informed analyses of the likely risks and returns.

A concern is that some parts of the DRA appear to be assuming that Pathfinder will represent the main contact between the DRA and Industry. The DRA now has a matrix structure with Package Management being on the one axis and the technology providers, the Sectors, on the other. Pathfinder is very much a Package Management driven activity whereas Industry is more closely aligned with the Sectors. This could generate a feeling of remoteness from the "coal face" and leave Industry feeling somewhat isolated from its natural partners.

Whilst Pathfinder and other Package Management initiatives are important in that they allow Industry some view of the strategy behind the DRA's activities, it cannot be assumed that they replace the more traditional relationships that exist between the DRA Sectors and Industry in such fora as Research Consultative Committees. Industry is interested in the technology generation capabilities of the DRA, not in its technology programme management.

2.5 *How does the DRA identify future defence needs, and is its method of identifying such needs properly thought out?*

It is the MoD's responsibility to identify (with the FCO) the future defence needs, and for the DRA to advise on how those might be fulfilled in the future.

This process will work satisfactorily provided that the DRA maintains an expert knowledge in all appropriate areas. Increasingly, this will not be possible and it may well be appropriate to involve Industry more closely in the strategic planning stages.

The role of the DRA Package Managers is a difficult one and they mainly depend on the advice of the DRA business sectors for the research plans to meet the MoD research objectives. Pathfinder can inject an independent view at this stage, but often the involvement of Industry is not as productive as it could be, due to lack of information on MoD requirements.

3. THE DRA'S RELATIONS WITH INDUSTRY, EUROPE AND THE WIDER WORLD

3.1 *Is enough being done to link the DRA's defence-orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?*

DRA has little competence to assess the market value of the civil element of a dual use technology and so is poorly placed to advise the MoD customer, who in turn accepts no responsibility to support the UK industrial base. If DRA involvement in dual use technology research via LINK or any other means is merely a way of reducing costs, then it will fail. A fundamental change in MoD's attitude towards supporting UK Industry is needed.

There is an obvious benefit in linking civil and military research programmes where possible; however, defence research objectives should be set to meet defence requirements. To try to carry out a research programme with the specific intent of catering for civil spin-off would be difficult for MoD, as the defence customer, to accommodate, because the market drivers are so very different. The civil market demands fast entry, fast turn round and different quality requirements.

There is scope for Industry to use the DRA on a sub-contract basis for specific areas of civil work. The most significant requirement, though, is that Industry should be responsible for determining the research needs in the civil field.

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

The most important consideration is that the technology is appropriate for the application and market. It also needs to be available at reasonable cost; to be at a reasonable level of completion; and to be without particularly onerous caveats and restrictions on its use.

3.3 *How does DRA connect to the Technology Foresight exercise being conducted by the OST?*

We believe that the White Paper from the Office of Science & Technology should have taken greater cognisance of the relationships between defence and civil sector research.

DRA resources and capabilities need to be considered as part of the UK's total scientific research base, not just as part of defence. We note with interest that the US OMB makes no distinction between money spent on Defence, Energy and Peacekeeping, all being regarded as "Security". We need to take a similar cross departmental view of the UK's research spend. This has always been a complex and difficult area. In some sectors, particularly electronics, the civil sector now leads.

There is both a bureaucratic gap and a complex relationship between civil and military research sectors. It is strongly felt that the White Paper did not take cognisance of these facts. It is also strongly felt that MoD's prioritisation should include consideration of the need to maintain a viable national defence industrial base.

3.4 *How effective are the DRA's links with the DTI and is there too little DRA involvement in the DTI's LINK scheme?*

The DTI has only limited funds available and these should be targeted at improving the capabilities of industry. Where the DRA has something useful to offer then it is realistic to encourage involvement in order to effect technology transfer and assist wealth creation. However, the function of the DTI is to support UK industry. To this end, any involvement of the DRA in DTI programmes should take place only when this is to the benefit of industry and is under its supervision. Industry would not regard the use of DTI funding for the DRA merely as a means of making up for cuts in MoD funding, as being at all helpful. The bringing together of the DTI's National Strategic Technology Plan with a similar initiative being undertaken in the military sector by DSAC, would help focus joint DRA and DTI activity.

3.5 *Has the DRA effectively filled the void left by the demise of Defence Technology Enterprises, and is the DRA any more likely to succeed where DTE failed?*

The DTE failed because the concept that DRA was full of ideas that defence contractors were too slothful to exploit was flawed. DRA, with greater freedom to exploit its IPR and the prospect of reward, might find more outlets, especially in partnership with industry to assist in the wealth creation process.

3.6 *What is to be the DRA's role in the issues of conversion and diversification in the defence industry as a whole?*

The only realistic role for the DRA in this area is to provide expertise and support as required by Industry. It is difficult to consider the DRA as having a proactive part to play since it is not in a position to judge the needs of Industry.

3.7 *How should it relate to the part of Industry which is not concerned with defence and how much should it focus on dual use research?*

The DRA's prime role is to support MoD by providing technology know-how and by conducting research programmes aimed at developing the technologies required for defence purposes. Any activities relating to non-defence applications or to dual use research are subsidiary spin-off. Industry would encourage the wider dissemination of DRA research results into the civil sector. The process of exploitation would be enhanced by the market drivers and could promote dual use research projects.

3.8 *How is the matter of potential competition between the DRA and private Industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

Industry still has many concerns about competition with the DRA and the control by the DRA of Industry IPR.

Acting as the agent of the MoD, both for the procurement of extramural research and as technical authority on major equipment programmes, the DRA has access to much Industry IPR and financial information which is competition sensitive. These concerns mainly relate to competition for research work. Competition in the areas of facilities and services is probably less controversial.

The proposed secondary competition for aspects of the DRA applied research programme will be managed by the DRA themselves, through the Package Managers. This process is bound to highlight the concerns raised above.

3.9 *What kind of relationship exists with the EC Framework Programme and other European (including non-EC) programmes, such as EUCLID and EUREKA?*

DRA is the UK contracting agency on EUCLID and EUREKA and tries very hard to gain what they perceive to be the best advantage for the UK. The perception of best interest, however, differs between DRA and the industrial participants. DRA sees its role to acquire the highest UK profile on the management of tasks as being the best value for Government funding while, in general, industry wishes to access as much technology as possible with minimum management overhead—a case of industry risking its own money, with little influence over the objectives or direction, while DRA oversees someone else's.

3.10 *Does the DRA seek European collaboration as a matter of course?*

This is not the perception of Industry. The DRA appears to favour collaboration with the US, although there are signs that the DRA is trying to increase its participation in European collaborative ventures as a means of attracting funds.

3.11 *Is there in other countries anything relating to the management of defence research from which the United Kingdom could learn?*

The US Advanced Research Projects Agency (ARPA) would seem to be the most appropriate organisation with which to make comparisons and from which lessons could be learnt. ARPA is an organisation which provides project management expertise to government funded research programmes being undertaken by Industry.

Another specific learning case, as an example, is the US DoD Manufacturing Technology Programme, which funds the development of plant and equipment (MoD does not), giving advantage to their manufacturing industry.

Examination of Witnesses

MR R COOK, Director General, FEI, MR E BRYDON, GEC-Marconi Avionics, MR T KERR, Hunting Engineering and MR J MACNAUGHTON, EDS, representing the Federation of the Electronics Industry, called in and examined.

Chairman

601. Good morning, gentlemen. We are very pleased you could join us. You will have heard Sir Ronald give evidence just now and that perhaps will have alerted you to the fact that although we give a list of questions we do not, I am afraid, always stick to them. Mr Cook, would you like to introduce the team?

(*Mr Cook*) Thank you very much, my Lord Chairman. I will introduce the team, starting with myself. I am Robert Cook, Director General of the Federation of the Electronics Industry. Our 260 members include companies in the defence, electronics, telecommunications, information technology, aerospace, business equipment and electronic components sectors. On my far right is Mr Tom Kerr, a director of Hunting Engineering, and Mr Eric Brydon, chief engineer of GEC-Marconi Avionics and chairman of the Federation's Aerospace and Defence Council. On my left is Mr John MacNaughton, a director of Electronic Data Systems and chairman of the Federation's Contracts Advisory Committee.

602. Thank you very much. Would you like to make an opening statement before we launch into the questions, Mr Cook?

(*Mr Cook*) I would like to make a very short statement, if I may. The defence companies of the Federation have had a long and close relationship with the Government's research establishments which has been mutually beneficial in terms of meeting defence requirements and creating wealth. In a rapidly changing world we would wish to see maximum benefit drawn from bringing together the technical expertise of the DRA and the wealth creating capability of industry. Our concern is that the uncertainties surrounding the DRA's position on competition, the ownership of intellectual property rights and its ability to assess contract bids on behalf of the MoD without a conflict of interests, is raising difficulties in the relationship between industry and the DRA. It is our hope that this enquiry will underline the need for a closer industry/DRA/MoD and indeed DTI interaction to maximise the research capability within the United Kingdom and the potential of dual-use technology for both MoD and the civil sector.

603. Thank you very much indeed. I wonder, perhaps before we launch on the questions we have suggested, if I might ask a question of Mr MacNaughton, because I think you come from the very company which was mentioned just now by Sir Ronald Mason? (*Mr MacNaughton*) Yes, I am expecting the bill next week, my Lord Chairman!

604. I wonder whether you would like to comment on the hypothesis that you could have a good systems operation without the research and development capacity? Does that in fact describe your organisation?

(*Mr MacNaughton*) It is almost 100 per cent correct, to accept what you have just said and what Sir Ronald said before. You do your research in a very different way. We have 80,000 employees worldwide and we have, to the best of my recollection, something like 2,500 of those employees, not all necessarily in one country but spread around the world, whose responsibility it is to understand the current and future offerings of the hardware manufacturers, the designers of software products and so on, and also to look at the widest range of possible applications to which the current and future offerings can be put. Then, with that knowledge behind us, to take the requirements of a specific market sector, for example international banking, and to determine what that market wants and how we can pull these different technologies, capabilities, current and potential, together to provide them with the most effective and efficient service which they need to support the business that they are in. We do also a considerable amount of development work ourselves but not research as such, we have a distinct dividing line between the R and the D of R&D. We do in the United Kingdom something like £60 million-worth of software development design and systems integration for operational systems for the United Kingdom armed forces, and there we have particular research and development skills but they are very narrowly focused on the specific defence requirements which we are in contract to supply. I am not sure if that answers your question, my Lord Chairman.

605. That is very helpful. Can we move then to the questions. I would like to start by asking the first one listed there, would you like to give us your views about the role of the DTI and to what extent you would wish to see it representing industry in determining priorities within the Ministry of Defence and specifically the DRA?

(*Mr Cook*) My Lord Chairman, we have as yet seen no results of this new co-operation between DTI and MoD; but we understand that DTI sees in the DRA's changed status new opportunities for collaboration in wealth creation and the transfer of technology from defence to the civil sector. Of course as representatives of industry we would welcome that. But I wonder if I may just turn to those members of FEI companies present for more specific points?

(*Mr Kerr*) I do not believe, my Lord Chairman, that one can really separate totally the responsibility between the Ministry of Defence and the DTI. Both have, and should have, a real interest in the future capability of UK industry. MoD at this moment has no responsibility, as I understand it, for that requirement, although it does take into account the implication of any decision it makes on the resulting industry. I believe that there is, as Sir Ronald said, a need to bring a closeness between the civil and military sectors, and certainly to use civil technology, which is becoming the driving force, into greater use in the defence environment.

606. But you make the point that you do not want the DTI programmes to fill the gaps in the MoD funding, you want industry to be in the driving seat

[Chairman *contd.*]

effectively, or certainly to be consulted very fully, as to how these programmes might be appropriately determined?

(*Mr Kerr*) Absolutely, my Lord Chairman. Yes, I agree with that.

607. Would you like to tell us what mechanism might appropriately be put in place in order to achieve that? Clearly, at the moment you are critical about the opportunity that industry has to be consulted and contribute to determining priorities.

(*Mr Kerr*) That is absolutely right. I think there is a real opportunity for industry to be able to put forward programmes which it sees as an opportunity for use in defence systems for the future. The problem generally with these proposals is that the defence requirement could call for a much greater robustness, a much greater temperature range, a much greater something that fulfils that defence requirement. I believe that industry should be pushing its technology in this direction. One of the advantages that the United States has relative to the United Kingdom at this point in time is that they have set up the mechanism whereby the specifications for equipment for defence will be modified to take advantage in civil technologies to a greater extent than any other nation I know of.

Lord Howie of Troon

608. You state, I think quite correctly, that the DRA is not in any way independent from the Ministry of Defence, which is clear enough. This suggests to me that in the business of civil/military co-operation the DRA is somewhat removed from the connection, and the co-operation appears to be between the Ministry rather than the DRA. Does this mean that the DRA can have an input into this thing? Can it drive the MoD, or does it sit about waiting to be told what to do?

(*Mr Cook*) From our perception, and I have heard that said by the DRA itself, it is in a formal sense sitting there waiting to be tasked in terms of operational requirements; but in another sense, because of the degree of expertise in the DRA, it is involved in an iterative process with MoD staff in terms of producing advice during the thought processes that lead up to the formulation of operational requirements. So from my experience they are very much involved at all stages.

609. The co-operation might well be initiated in the DRA rather than in the Ministry?

(*Mr Cook*) That I am not so sure. There is certainly a close coming together in my perception between experts in the DRA and those formulating operational requirements in the MoD. I do not think the MoD could produce operational requirements properly without that linkage with the DRA, the Defence Research Committee, and so on.

(*Mr MacNaughton*) I think you have a particular problem which has been brought about by the change in the status of the DRA. They are certainly sitting there waiting to be tasked, and they respond properly to whatever tasking is carried out. What has happened with the change in the financial structure, prior to the advent of the trading fund status which does not occur for a few more weeks, is that they have less resources both in money and people terms to dredge their intellectual bank and to go to the Ministry of Defence to say, "We've had a look at this and we really think you should be interested in it because, because, because". I think there has been a deterioration in that second activity since DRA was divorced from the Ministry of Defence and put under what are called (but I do not recognise them as such) "normal commercial disciplines".

Lord Renwick

610. Does Mr MacNaughton mean that requests from the MoD to the DRA for certain information have to be not only in technical terms but in financial terms, the actual cost of finding out that information?

(*Mr MacNaughton*) Yes, certainly, Lord Renwick. The Ministry of Defence actually buys that service from the DRA in very much the same contractual way that it would buy a like service from industry, were it to go there for it.

611. This has been the practice for the last year, even before the trading fund status?

(*Mr MacNaughton*) Yes, the system of budgetary control through contracts, rather than general budgets, to support the level of effort with particular levels of skill within that level of effort, has brought about this change.

612. Before that the MoD could ask the DRA, who had a team of people who would be tasked with doing that under their normal contractual arrangements, and the answer would come. This is a rather necessary financial discipline being put on the DRA.

(*Mr MacNaughton*) I take your words advisedly, Lord Renwick. The situation is that the Ministry of Defence will task DRA and, in the same way as industry when tasked by the Ministry of Defence, says, "We can actually give you a report, or we can produce some deliverable object for, let us say, £400,000", then DRA are authorised by the Ministry of Defence on a contractual framework basis to spend £400,000. If, in fact, to give the absolutely best answer it might take £600,000 of cost then, under the present arrangements, they stop at £400,000.

613. In your summary of information is this what you mean by the "new matrix management system may result in a dilution in the quality of the research undertaken", or is that a different part?

(*Mr MacNaughton*) That is a slightly different scenario.

Lord Renwick] Perhaps we could come back to that later because I think that is relevant.

Chairman

614. Before we leave this particular subject, I would like to explore the mechanism, which I am not yet clear we have an answer to, as to how you wish industry to make a more positive contribution to determining these priorities?

(*Mr Kerr*) I wanted to come back on the previous issue which was the question of how this operates. The package management is driven down to a very low level of package; that is a low level of money and a narrow description of the technology. That in itself

[Chairman *contd.*]

prevents people naturally thinking of systems and growing the system activity from it. They are responsible for seeking the work from the Ministry of Defence also from people who are at a low level; so there is a fundamental mechanism which prevents a good management to enable DRA to take on systems. I thought that was the point I would like to make, to add to what Sir Ronald Mason said.

Baroness Hilton of Eggardon

615. It also presumably inhibits the free flow of research?

(*Mr Kerr*) Absolutely. It prevents the flow of research to the new systems concepts levels.

616. The scientists are stuck with whatever you have been told to do within a certain budget; and research is very often something organic, is it not?

(*Mr Kerr*) It is but it has to be related in the end to other capabilities of the system in which it will be used.

Chairman

617. Could we move on to dual use technology? You make the point that industry should determine the importance and applicability of any civil application of a dual use technology. Again, I have to ask the question: how is the industry going to do this; what mechanism have you in mind to achieve this? What are the implications for funding thereafter?

(*Mr Cook*) If I could just start and then ask my colleagues from industry to speak. In terms of dual use technologies, if industry perceives a civil use for a defence technology it is going to take the initiative to exploit it either in individual companies or perhaps by a consortia. We have heard in the earlier evidence this morning that more and more it is the case that civil technology is directly applicable to the defence area, and this will already have been funded the civil sector. In terms of dual use technology, what we would like to see are more common research programmes, for example, like the joint MoD/DTI programmes in the aerospace area, as well as a very clear understanding at an early a stage as possible of what the DRA and the MoD perceives are their core technologies, those that they are primarily interested in; so that industry itself, knowing this, can establish its own priorities and make its investment decisions based on a fairly clear idea of what the key MoD interests might be. They can also, therefore, make an assessment of where they might have other applications. I do not know if Mr Brydon would wish to add to that from an aerospace industry perspective.

(*Mr Brydon*) The mechanism is a difficult one to answer. It has to be joint; it has to be industry leading on the civil side, the reason being that there is no expertise within the DRA on civil markets; they have always researched defence. It is a learning process therefore with the DRA in civil terms, and until that happens it is very difficult to see a mechanism evolving at this time.

618. Let us take the aerospace area, which I think is your particular interest, is it, Mr Brydon?

(*Mr Brydon*) Yes.

619. You refer again under paragraph 3.4 to the DTI's National Strategic Technology Plan, and you refer to a similar initiative being undertaken in the military sector by the Defence Scientific Advisory Council. Is this an example where you feel that the two should be combined? If so, where does industry fit into this because industry cannot necessarily assume it is effectively represented always by the DTI, can it?

(*Mr Brydon*) No, it cannot. The equivalent to the NSTAP, as we call it for shorthand—

Baroness Platt of Writtle

620. Sorry?

(*Mr Brydon*) The National Strategic Technology Acquisition Plan, which is referred to in our written evidence. There is a military equivalent of that, which is the National Defence Strategic Technology Acquisition Plan. Joining the two together has not been attempted, and again we go back to what mechanism would you use or propose to merge the two. That, we would maintain, in industry can only be done as a triad; it has to be MoD, DTI and industry which does it. Industry knows the civil market, the MoD and the DRA know what they want in defence. It has to be a triad. The only mechanism we would have is to set up some form of committee to probe these questions.

Chairman

621. Does a triad imply there will be equal responsibility for funding or just equal responsibility for determining priorities?

(*Mr Brydon*) Equal responsibility for determining the progress and the possibility of dual technology. It is a word which is used and sometimes it is not defined very well.

Baroness Platt of Writtle

622. Sir Ronald Mason said he felt there should be a need for a defence review at this stage. Do you think that has not happened? Has the National Strategic Technology Acquisition Plan you referred to not determined those priorities?

(*Mr Brydon*) Not really. The technology acquisition plan was laying out technologies that were necessary for research and development purposes within the United Kingdom to satisfy the military requirements rather than laying down the future battle scenario or the future defensive scenario.

623. So it is an important thing which ought to be carried out, you think, as a kind of base on which to set your triad?

(*Mr Brydon*) Yes, indeed.

(*Mr Cook*) If I might add to that: I think what is missing, and what we are seeing as an attempt to put in place with the Technology Foresight Programme from the OST, is an overall national strategy for technology, and in our case we are particularly interested in this initiative for the electronics industry. Without this stategic underpinning it is very difficult to make sensible decisions, and certainly for

[Baroness Platt of Writtle *contd.*]

industry and companies to make long-term investment decisions.

Lord Craig of Radley

624. Is there not a bit of a chicken and egg situation here, in the sense one is starting to look at blue skies research, and is it the research which leads on to a commercial application or is it some commercial idea which drives that blue skies research?

(*Mr MacNaughton*) If you look back in history, and I will go back to the 1950s which was the burgeoning of my career, there was a great deal of technology around in the microwave area. The real push and impetus for the application of that microwave technology actually came from the Army and the first manifestation of this was a battlefield mobile microwave communications system known as the E 10—a devil to set up but very effective once you got it working. Now if we come up to the present day, the real body of knowledge and research capability in microwave technologies from components to application almost entirely sits within industry, so if the Ministry of Defence has a requirement which microwave technology is a suitable answer to, then the role of the DRA there should be to know where those centres of excellence exist and to draw that knowledge through from those. I cannot give you a clear example, although I am sure my colleagues would be able to do that, of where in fact that centre of technical excellence resides within the establishments. Our problem within industry is accessing that and it is very difficult at the present moment. They will talk to you, as I said on a previous occasion before your Lordships, about those things which they believe are relevant to the relationship between your company as they perceive it and what the DRA wants to talk to you about. You cannot dip into this much larger pool of technology to determine whether there is something in there which you can exploit in a civilian way, or from your experience as a defence contractor adapt as a solution to some other requirement.

Chairman

625. Do you feel, although the DRA research expertise has migrated into the private sector, that it should no longer have a research capacity but should nevertheless retain an expertise to advise?

(*Mr MacNaughton*) I believe that is so, otherwise you are actually espousing duplication.

626. So, back to mechanisms again, who is going to determine, and how, as to where the research can safely be left in the civil sector without threat to the defence of the realm?

(*Mr MacNaughton*) It is not an issue which requires specific determination in a formal way. It is rather like when you go out of the building and it is raining, you know it is raining. In the same way you know the centre of excellence has migrated from one particular point to another particular point. There is essential duplication as that migration is taking place and it can actually see-saw backwards and forwards over decades until a particular technology or its application becomes obsolescent and is superseded by something else.

(*Mr Cook*) I think the point which was made earlier about the very close relationship—the triad or, maybe with all the other bodies, more than a triad—is that a clear knowledge and an early knowledge of what requirements are in the defence area will allow better use to be made of the capabilities which are available in the civil sector. Indeed in areas like information technology, as we have already heard, it would be impossible to duplicate the Civil R&D effort in any Government establishment.

627. You referred earlier to the technology Foresight exercise, to what extent does this meet the requirements of the triad you referred to, or indeed wider consultation?

(*Mr Cook*) I think it might be in time a very useful factor, at least, in trying to meet those requirements. Our problem at the moment, and we have been very interested in Technology Foresight from an FEI point of view, is that it has not really got going. It is still in the process of setting up its sector panels and getting the exercise under-way. I am encouraged by seeing some linkage between the Technology Foresight activities which are being proposed within the DRA, as part of John Chisholm's plan, and the overall national plan, but I think we are at such an early stage it is difficult to really see whether this is going to give us what we want or not.

628. Could we have a word about Pathfinder? You commented on it in the written evidence but would you like to add anything to what you said?

(*Mr Brydon*) The Pathfinder exercise as it currently is in its second year is much more refined, much more streamlined, than it was in its first year. So we have industry packages which are matching up with the DRA package system, and to that extent it is better. However, industry still requires better visibility of MoD's requirements in order to focus these proposals. It is that visibility I think which is a theme we will come back to. Quite often the visibility of these requirements is really what it is all about. It is better, it could be better, one hopes that it will be better as time goes on.

Chairman] Can we move on to the categories of questions listed under DRA and Science.

Baroness Hilton of Eggardon

629. We have actually covered this to some extent when we were talking about the effect on creative research of the new business planning, business package system. You were saying it was inhibiting in terms of what tasks were set for scientists to do. I think there is also a problem, is there not, about the actual time of scientists being taken up by the administration and management of financial packages? Do you think this is a problem in some way, of relieving them of that particular burden in order to devote themselves to science?

(*Mr Cook*) It is a concern we have had. I think it might be appropriate to ask some of our industry representatives, who have a day-to-day relationship with DRA, to give their perception.

(*Mr Brydon*) I think the answer to that is, perhaps in our written evidence we were quite critical on this point. Since we submitted our written evidence things

[Baroness Hilton of Eggardon *contd.*]

have moved on within the DRA. I think I heard earlier this morning about the question of morale in the DRA, and are they being managers rather than scientists, and I think you are asking the same thing. The answer is, yes, they were all swimming around trying to manage in a way out of fear, fear of instability, fear of being unemployed, fear that now the DRA was going to be so accountable they did shed a lot of staff, and that has had an impact. The system now, with communication from top to bottom within the DRA, is much better. I think we are now beginning to see the scientists involved in scientific work and less of this rushing around as we used to put it, if you will pardon the expression, like headless chickens. The situation is improving.

630. Good.

(*Mr Kerr*) It is important to understand that there are three levels of activity in the DRA. They do devote about 7 per cent of their budget to what is called "blue sky research", and way-out research which might or might not give a capability in the future. It is something only they are really funded to do. Industry have great difficulty in funding that sort of operation. The second is developing the technologies where they are applying the technologies to programmes, and here the mechanism you describe is a distinct disadvantage in the sense that packages are driven down, and one is really looking for a means whereby, at the end of the day, they will be applied. The third activity they do is in fact to be the expert adviser to the Ministry of Defence where they need a knowledge across the board but not a research capability. Each of those three have to be handled in a different way.

(*Mr MacNaughton*) Part of the problem is that over many years now the Procurement Executive of the Ministry of Defence has divested itself of its technical competence and has relied upon the establishments, now the DRA, to fill in that gap, so that they remain collectively a knowledgable customer. Some years ago we were asked why these brilliant double-first scientists who joined the research establishments were leaving in droves to industry. It was thought we paid them too much. In actual fact the reason why they left was the reduction of technical competence within the procurement executive reached its peak at a time when wider competition was introduced. You had these chaps who had gone in to the research establishments expecting to do "over the horizon" research sitting there actually comparing the technical offerings of competitive bids on technology that must be three, four, five or even ten years' old; and that was the frustration factor which led them to leave and not the supposedly higher rewards in industry. That still continues today, so you are losing one part of your scientific capability to doing what is really very routine technical work, because there is not a capability elsewhere in the procurement executive to carry it out. In addition to which the Ministry of Defence procurement executive decides to run a competition for procurement work and the DRA is to be one of the competitors, and industrial firms are the other competitors, then the DRA will take scientific effort off whatever it might be doing in order to prepare its proposals for that work in competition with industry. That is another dilution of the technical scientific capability available within the DRA. That is brought about by the framework structure that DRA have to operate in. Even if the volume of those diversions reduces, it needs to be asked whether it is right to take a technical centre of research excellence and divert that capability to do these sorts of things.

Chairman

631. In the management of science there is always tension between those who would like to do blue sky research. It is rather like the tip of a pyramid, there has to be very much more applied or developmental work underneath the pyramid. There has never been a research institute where there has not been a pressure from the double-firsts to try and work at the pinnacle and being told, "No, you've got to move back down to the base of the pyramid". Is there anything unusual in it?

(*Mr MacNaughton*) There is nothing unusual in it, but in the normal type of operation outside DRA, in commerce in the universities and so on, they are not required to vet the technical content of competitive tenders for old technologies; that is one diversion of that scientific skill.

632. Some industries do have some blue sky research, and there are equally competitive demands on time. Research managers are always trying to determine priorities.

(*Mr MacNaughton*) You do not take your people off your blue sky research. You actually make a proposal that uses four, five or ten year old technology to a customer.

Lord Howie of Troon

633. I was about the ask very much the same question as you have just done, my Lord Chairman. Science and scientific research has got to be managed by somebody, it is possibly better that it should be managed by scientists rather than what are described nowadays as "managers", as though they were a breed apart. In a sense this particular activity which you are criticising is almost entirely inevitable and inescapable. There is a further element in it: leaving aside these double-firsts (who are extraordinary people I dare say, but I am not too familiar with them) there must be a substantial number of scientists who actually want to be managers because they see this as a career progression. You must be very familiar with these people in your own field of activity, and perhaps yourselves, who can tell? Are you perhaps not creating something like an Aunt Sally here?

(*Mr Brydon*) I myself have managed to stay technical and have always been happy to do so. I am not so keen on the management side. I think what you are saying is right, yes. It is again changing and has changed fairly recently, that a career structure can be pursued now on the technical side as well as on the management side. The two arms of industry, if you like, are now considered much more equal than they were before.

Chairman

634. I wonder if I could move back to a different aspect of this, competition, which is a relatively new feature between DRA and industry competing for tenders. A different aspect is the concern that industry has that they are required to collaborate with the DRA at one level, and they find themselves in competition at another level. This is something you have dealt with in your evidence, particularly with reference to work on PCS and parts control. Would you like to elaborate further on that?

(*Mr Cook*) It might be helpful if we asked our three companies their perceptions of what they feel about that. This is at the heart of one of our major concerns.

(*Mr Kerr*) The problem that one faces in this is that in activities such as the new Pathfinder proposal industry is putting forward proposals which it may either be funded fully or jointly funded with the DRA, and so industry is in the process of handing over its future thinking, on the one hand. At the next level down it is competing with the DRA for some form of applied technology work in which this proposal may have a place, and so we are very concerned about how the DRA will handle that problem. The problem, I think, is amplified by the fact that policy changes are continuous and certainly there is no sign yet of settling down. On the one hand competition was full at one stage, then there were some collaborated agreements and joint agreements which eventually the DRA withdrew from because it could not sustain a position where it was working with one industry and not with another. This is at the moment a continuously changing process. So we do not know in industry where it will settle in a year's time or two years' time and so on.

(*Mr Brydon*) I would echo that, my Lord Chairman. The bottom line of this question really is that of IPR, intellectual property and the rights of that property, which is always a concern of industry when working with anyone, but the DRA, yes. It will remain a touchy point, I think, and it will remain one which is difficult to get round fairly for both sides, I think. The DRA are committed to work with a number of industries. It will always remain a concern, that if we are feeding IPR into the DRA we would always feel we would want it well and truly protected.

Lord Craig of Radley

635. That will apply both ways, to the extent DRA has intellectual property?

(*Mr Brydon*) Yes, I agree. It is one of the trickiest problems we face in the interface.

636. But it is not a one-way problem?

(*Mr Brydon*) No, it is not a one-way problem.

(*Mr MacNaughton*) I will try not to repeat something I said to your Sub-Committee on another occasion, my Lord Chairman, but I think that it is not possible to over-emphasise the IPR position of industry and the way in which it feels threatened. If I can give you a small illustration: the Ministry of Defence has rights in research development, designs of systems and so on, and those rights extend to uniformed personnel in the armed forces being able to repair, maintain and even to modify the equipment which they have purchased from industry. Under market testing the Ministry of Defence would now like industry to carry out those tasks which hitherto have been carried out by uniformed members of the armed forces, and are seeking to change the existing practice relating to intellectual property rights in order to achieve that because they do not have the right to pass the necessary information on to non-military organisations. Now of course industry is concerned about that because the people who will receive the information are the competitors of the owner of the information, and of course the edge of competitiveness is that you know something your competitor does not know, or you have a way of doing something which he does not do quite so efficiently or effectively. That is one concern. Another concern that we have of course is that in order to achieve that one very specific objective, which is to have work previously done by uniformed members of the armed forces done by companies in the private sector, the Ministry of Defence is changing, or seeking to change, the intellectual property right conditions which are enshrined in every contract for research and development, but they are seeking to change those in such a way that they acquire the entire rights of ownership and usage with absolutely no constraint whatsoever. Now to the extent the DRA is part of this closed circle of information, that puts the DRA in a totally different position when competing with industry for work, where the Ministry of Defence itself is running the competition. It also, I am afraid to say, if it is not addressed very, very soon and very, very intelligently, makes a lot of discussion about collaboration between the civil sector and the Defence Research Agency just talk; it will not happen. I would say it as strongly as that. Unless the reasonable interests of the civil sector are adequately protected by the well-balanced intellectual property right arrangements, co-operation will be stymied almost from the beginning. When the Alvey Programme was generated by the Department of Trade & Industry we developed a framework which dealt with intellectual property rights, background, foreground, rights of use, march in rights, rights of supply and so on and so forth; there has not been a better framework produced since then. Unfortunately it spreads even beyond the bounds of the United Kingdom. If we look at the Draft Council Resolution in the European Community called Value II—and if you wish, my Lord Chairman, I can make copies of that available (*not printed*)—you will find within the European Community the Community is seeking to acquire these rights for the framework programmes like Esprit I, Esprit II, RACE, BRITE and so on which come under the Value I and Value II programmes. Now we are rapidly moving to a stage where in fact the moves which are taking place from the official end of the relationship are such that it will actually drive us further apart rather than bring us together, and it is a very serious matter.

(*Mr Brydon*) When thinking about IPR and research, it is more than often the case industry is putting its own funds into its part of research, so it is industry investment. There are very few 100 per cent funded programmes—by 100 per cent funded I mean funded from MoD, so industry is making its own investment, usually it is on a 50 per cent basis. Therefore when you think about it that way, you can

[Lord Craig of Radley *contd.*]

see the incentive to invest at that level is not there if we cannot protect the IPR.

Lord Renwick

637. What are the implications of this, and what Mr MacNaughton has just been telling us, in the short and medium term?

(*Mr Cook*) The implication is that unless we can get a suitable framework, perhaps the Alvey example, it will be very difficult to get the degree of collaboration which is envisaged, and I think it is going to inhibit things very greatly.

638. And that will prevent the knowledge across the board, which is so vital?

(*Mr Cook*) I can see an interesting paradox here because I am sure that all the companies in membership of the FEI will be pleased if the defence cost review means more defence work coming to industry, but unless you can solve the IPR problem it is going to be very difficult to accomplish it.

(*Mr MacNaughton*) This actually is a two-way problem. It afflicts the Defence Research Agency in just the same way it afflicts industry at the present time. They have equal concerns, or should have.

Baroness Platt of Writtle

639. I will in a moment refer to question 9 but perhaps following on what we have just been talking about, you do say, and it was your answer to 3.1, "A fundamental change in MoD's attitude towards supporting UK industry is needed." That is elaborated in succeeding pages in the answers to questions 3.3, 3.4 and 3.7. I must admit when I was reading through this I was putting "How" by the side of it. Do you think a fundamental re-write of the framework document for DRA and possibly, going back to this defence review, of MoD is what is needed in the first place?

(*Mr Cook*) If I could just start on that one. The fundamental change that we are thinking of is perhaps stepping back even further from that. What we would like to see is some form of recognition by the Ministry of Defence that it has some responsibility for the health of the defence industrial base, and in maintaining the competitiveness of its industrial suppliers. I understand all the difficulties of that, but certainly there should be some recognition in the MoD of what is a very serious concern of ours.

640. Would you, as Sir Ronald Mason did earlier, take the United States example of ARPA as a way of doing that?

(*Mr Cook*) We think ARPA is the most promising example of that sort of initiative that we know of. We would therefore be very excited indeed if a similar initiative were being talked about here. I think the follow-on point from that is, from out point of view, we really feel the Ministry of Defence must provide industry with sufficient information on its equipment procurement early enough, and this really ties in with my competitiveness point, to allow companies to make sensible decisions on their forward investment and preserve and develop their capability. In terms of defence sales, of which we have been doing quite well in the last few years, much of the technology that is being sold is based on the research and development done some ten or 12 years ago. If we cannot have this long-term co-operative view and knowledge and therefore make the right investment decisions, I suspect that the success we have had in defence sales latterly will not be easy to achieve in a few years' time.

641. Going back to question 9,[1] in your response to question 2.1 you refer to problems concerning the use of national facilities operated by the DRA. How would you recommend their reorganisation to overcome the problems you referred to?

(*Mr Cook*) I would like to ask my colleagues in companies who have to use these and have been concerned with the problem to give their view.

(*Mr Brydon*) The situation we are all looking for is that the facilities which are at the moment within the DRA—

642. Such as wind tunnels?

(*Mr Brydon*) Exactly.—are leased to both the DRA and industry on equal terms. At the moment, yes, there is bidding. If you bid into a contract piece of work you may find you are, in industry, costing the use of a facility, whether it is your own, somewhere else in industry, or within the DRA, that goes into your bid, and you may find yourself disadvantaged because the DRA already have that facility and are not picking up the costs for using it. That really puts industry on the wrong side.

(*Mr MacNaughton*) We do have a secondary problem as well, which is that if the DRA has a task from the Ministry of Defence and the contractor has a contract which requires simultaneous use of the same facility, one automatically knows where the priority will be placed, and that is not very good. We did recommend to your Lordships before that wider use could be made of these, by more aggressive selling by DRA of these facilities in a number of areas where perhaps they are not aware that they exist, or they are not aware of the uses to which they can be put.

Lord Howie of Troon

643. Do you not sometimes find that your competitors occasionally have facilities which you do not have and you cannot get your hands on?

(*Mr Brydon*) Yes.

644. What is the difference in this case?

(*Mr Brydon*) It is much more rare that your competitors will have facilities that you do not have but you want. The facilities within the DRA are usually of a very expensive type for industry to invest in similar facilities. I am now talking about some of the very large simulators, for instance, that both assess systems and that you can assess your own equipment on. They are very expensive for industry to set up, both in terms of the hardware, which is the equipment, and the software which goes into them. They are very expensive and you would not normally find industry setting them up. On the other hand, most of the bids that go in of that type you will usually find now are collaborative within industry, so

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[1] Question 9 read as follows: In your response to question 2.1 you refer to problems concerning the use of national facilities operated by the DRA. How would you recommend the operation and management of these facilities be reorganised to overcome the problems you refer to?

[Lord Howie of Troon *contd.*]

that for instance in the purely systems side and electronics side you would be teaming up with an air framer and air framers do have those expensive simulators. So it does work that way.

Lord Howie of Troon] That was what I had at the back of my mind.

Baroness Platt of Writtle

645. On the other hand, these are publicly funded so they ought to be available both to industry and the MoD, presumably?

(*Mr MacNaughton*) But at the same price.

(*Mr Brydon*) On the same terms, yes.

647. I understand. You also mention in your answer to question 2.1 a particular company's problems. Were those problems caused by the trading fund status or were they caused in another way?

(*Mr Cook*) As I understand it, but my colleagues may want to add something to that, it probably reflects the problem of the changes going on in the DRA, but there was a feeling, certainly in this particular instance, that there had not been a timely enough access to the facilities and support that was required, and that was actually inhibiting the competitiveness of the company concerned.

(*Mr Kerr*) It did not originate from me.

(*Mr Cook*) That was the general flavour, I think.

Chairman

647. Do any members of the Committee have any further questions they wish to address to our witnesses? If not, I thank you very much for the patient way you have addressed the questions and helped us in our enquiry. Thank you for joining us today.

(*Mr Cook*) My Lord Chairman, we very much appreciate being able to give our views.

THURSDAY 21 APRIL 1994

Present:

Craig of Radley, L.	Trefgarne, L.
Howie of Troon, L.	
Platt of Writtle, B.	Dainton, L.
Redesdale, L.	Dean of Beswick, L.
Renwick, L.	Nathan, L.
Selborne, E. (Chairman)	Porter of Luddenham, L.

Memorandum from the Office of Science and Technology

1. *What responsibility and authority does the OST have for the integration or coupling of work done at DRA with the rest of UK government-funded R&D, and through what mechanisms does it pursue them?*

OST's responsibility for coordinating work done at DRA with the rest of Government-funded R&D derives from OST's mission statement as set out in the White Paper Cm 2250 (page 9). The Chief Scientific Adviser, who has a remit to provide advice to the Prime Minister on scientific and technological matters, is also the Head of OST (and sits on the Defence Science Advisory Committee).

The White Paper stated that "Better arrangements will be introduced for drawing together Government initiatives in science and technology issues, ensuring value for money from the science and technology which the Government applies in its statutory, policy-making and regulatory roles, and monitoring performance against the new Forward Look." (paragraph 1.18(10)). This applies across the board of Government-funded S&T, both civil and defence. The OST therefore has a direct interest in the S&T programme of the Ministry of Defence and, through that Ministry, of the DRA and its coordination with other publicly-funded S&T.

OST will fulfil its role in large part through the process of preparing the annual Forward Look of Government-funded Science and Technology. This process includes consideration by the Ministerial Committee on Science and Technology, on which the Chancellor of the Duchy of Lancaster sits with the Chief Scientific Adviser in attendance. The Forward Look will give a longer-term assessment of:

- the portfolio of publicly-funded work best suited to the broader scientific and technological needs of the country;
- the extent to which current individual Departmental science and technology programmes are matched to that portfolio, and the prospects for bringing about a closer alignment between the two.

The Forward Look is also to consider the scope for greater concerted action and collaboration both within publicly-funded S&T and between the public and private sectors; the balance between civil and defence research; and any gaps and imbalances in the national research effort. (paragraph 2.37) It will provide a benchmark against which future shifts in policy and S&T priorities can be measured and will inform decisions taken during annual public expenditure surveys. (paragraph 2.38)

The OST is already in touch with MOD about developing a series of output measures and performance indicators against which the achievement of the White Paper strategic aims will be measured. The outcome of this work will be reflected in the 1995 Forward Look.

2. *Beyond the involvement of the Chief Executive of DRA, in what ways is DRA, and MoD more generally, involved in the Technology Foresight exercise?*

One of the 15 sectors to be addressed by an expert panel in the Technology Foresight Programme is Defence and Aerospace. The work of these panels is central in taking forward the Programme. Mr John Chisholm, Chief Executive of the DRA, is the Foresight Steering Group member with particular responsibility for overseeing the work of this sector. Two Directors from the DRA organisation, and two senior members of the MOD Central Staffs, have agreed to serve on this panel. They will provide an essential input on military operational requirements, the balance of MOD-funded research activity (at DRA and in industry) and the potential for dual-use technology. The Chief Scientific Adviser at the MoD offered valuable advice on the balance of expertise on the Defence and Aerospace panel.

Contractors to MoD are also heavily involved in the panels. Dr Grant of GEC chairs the Manufacturing and Business Processes panel; and Rolls Royce and British Aerospace are involved not only in the Defence and Aerospace panel, but also in other important related panels such as Materials and IT/Electronics.

3. *The White Paper states in para 3.36 that the OST is to take responsibility for LINK. The Sub-Committee has received evidence from MoD to the effect that "the requirement that the DRA's contributions should count as part of the 50 per cent HMG share, leaving the balance to be found by industry, has undoubtedly put off potential collaborators" (MoD, para 3.4). Likewise, in oral evidence, the DTI spoke of the need to "revisit" the LINK rules.*

(i) *In view of its responsibility for LINK, can OST say what progress has been made with reviewing the LINK rules?*

(ii) *One proposal that has been put to the Sub-Committee is that now that DRA is a Trading Fund, it "could be regarded as an industrial partner for the purpose of LINK rules, so long as it constitutes less than 25 per cent of the programme budget". What is OST's view of this proposal?*

The White Paper Cm 2250 announced that lead responsibility for the LINK scheme would transfer to OST in line with OST's mission, in particular its cross-Governmental perspective and its role in stimulating interaction and movement of people between the science and engineering base and industry. The transfer was effected in September 1993.

(i) Since taking lead responsibility, OST has been considering how LINK can be developed to play its part to the full in promoting R&D partnerships and technology diffusion between industry and the science and engineering research base. Dr John Parnaby, Managing Director, Lucas Applied Technology Ltd, became Chairman of the LINK Steering Group (LSG) in November 1993, and the appointment of a number of new LSG members to fill current vacancies will now be made so as to promote the role of LINK in achieving the wealth creation aims of the White Paper and in responding to the outcomes of Technology Foresight.

LINK is already a very flexible mechanism for the promotion of collaborative research. It is being progressively developed, for example, regarding public sector body participation, single company/single research base partnerships and single Government Department or Research Council options for programme sponsorship. OST will consider what more can be done to meet the needs of LINK sponsors, and the participants and potential participants in LINK projects.

(ii) The establishment of the DRA as a Trading Fund creates a new situation, with new possibilities for involvement in LINK. The proposal regarding the terms under which DRA might participate in LINK projects as the industrial partner is an interesting one. OST would welcome more details from DRA so as to be able to give this proposal full consideration.

4. *The Sub-Committee has been advised that a cross-departmental study has been set up by OST to examine common interest groups of Agencies. Could the OST supply more precise information about the aims and scope of this study, and of how DRA is being grouped with other Agencies?*

The Government's intention to undertake a scrutiny of public sector research establishments was signalled in the White Paper Cm 2250 (paragraph 5.13). It is being conducted by a team from the Efficiency Unit of the OPSS. Members of the Scrutiny Team are drawn from other Departments and the private sector. They started work on 13 December 1993 and will make recommendations to Sir Peter Levene, the Prime Minister's Efficiency Adviser, by the end of April 1994. Sir Peter will report to the Chancellor of the Duchy of Lancaster, after which the Government will need to consider how to take forward the scrutiny team's recommendations. It is normal for Efficiency Unit reports to be published.

The Chancellor of the Duchy announced the terms of reference for the scrutiny on 2 February 1994. These are, "on a sector by sector basis;

(a) to identify those public sector research establishments where early privatisation is feasible and desirable;

(b) where early privatisation is not feasible or desirable, to identify the potential for rationalisation of facilities or capabilities, and recommend means of implementing such rationalisation;

(c) to consider where the changes to current ownership and financing arrangements for establishments would lead to more effective operation of the open market and better value for money; if so, to recommend one or more alternative models."

He made a further announcement on 3 March about the coverage of the scrutiny (Hansard 3 March cols 809-811) and listed the 53 establishments covered by the scrutiny. The DRA is not being covered by the scrutiny, initially at least. Options for the Defence establishments, including privatisation and rationalisation, are being looked at in the MoD's Defence Costs Study 4.

5. There appears to be widespread concern that DRA's primary goal of serving MoD is being interpreted in a way that inhibits its capacity to contribute to national wealth creation. A particular problem appears to be the requirement that defence funds can only be spent on defence objectives, which, it is said, could inhibit mutually beneficial relations between defence and civil programmes.

(i) *The Sub-Committee wishes to establish whether the apparent constraint on DRA playing a wider role derives from MoD policy, from Treasury controls on accountability for funds voted for particular purposes, from a mistakenly over-zealous interpretation by MoD of the Treasury position, or from some other cause. What is OST's view?*

(ii) *We further note Mr Waldegrave's evidence to the House of Commons Select Committee on Science and Technology on 9 February 1994, when he said that he does "not want to blame this on the Treasury", but rather on Government policy more generally. We also note his view that, while the Government continues to believe in the current policy, it is at least "worth debating" the argument for a change of policy. On this view of the matter, where precisely would a change of policy have to be made if such a change were thought desirable?*

The DRA's Framework Document defines the function of the Agency as follows:

"The DRA will provide on agreed terms:

— a range of scientific and technical services to MoD in the areas of strategic research, applied research, operational assessments and studies, project support, the formulation of Staff Targets and Staff Requirements and Support to the Armed Services;

— scientific and technical services to other Government Departments (OGDs);

— a technical and scientific service to meet the requirements of other public or private sector customers, where this supports the achievement of the first two objectives and is using capabilities required for defence and OGD purposes but not fully utilised." (paragraph 2.2)

While emphasising the MoD/DRA relationship, this specifically empowers DRA to meet the requirements of other public sector or private sector customers. Thus wealth creation is a proper subsidiary activity of the DRA. Developments such as Pathfinder and the Dual Use Technology Centre arise from this. In addition, paragraph 7.4 of the Framework Document explicitly encourages DRA "to develop agreements with industry to permit the transfer of technology for use for MoD purposes or other purposes, consistent with defence requirements". MoD is monitoring the effectiveness of DRA's contribution to wealth creation on the basis of this remit; the early signs are encouraging.

6. Published with the White Paper was the Levene/Stewart report "Review of Allocation, Management and Use of Government Expenditure on Science and Technology" which had been written to inform the White Paper. It is not clear to the Committee precisely when the report was finalised, but we note para 1.55 which recommends "that the DRA should aim and be allowed by MoD to become very much more involved with civil markets than is presently envisaged and that, to this end, the Agency should market its skills more widely and actively in order to realise more of its commercial potential". Do the measures described in chapter 4 of the White Paper represent movement from the position "presently envisaged" at the time of the Levene/Stewart Review, and if so, in what ways?

The DRA began operating as a Trading Fund in April 1993 under the guidance of a Framework Document agreed with the MoD. The Levene/Stewart Review report was published in May 1993. The Government's response is set out in the White Paper Cm 2250.

The Framework Document for the DRA sets out the aims and functions of the Agency. It was revised in 1993 when the Agency became a Trading Fund. The revision included a clause which took account of the need for the DRA to develop greater co-operation with industry, as follows:

> "In fulfilling its aim the DRA will . . . co-operate with industry in the United Kingdom to ensure that the DRA's output is exploited to the full, consistent with defence requirements . . . "

The Levene/Stewart report took a similar line and recommended that the DRA "be allowed by MoD to become very much more involved with civil markets than is presently envisaged and that, to this end, the Agency should market its skills more widely and actively in order to realise its commercial potential":

In the White Paper, the Government confirmed that MoD was making increased efforts to:

— ensure that the technologies its research generates were more widely available for civil use;

— make available for commercial exploitation the results of its research;

— encourage collaboration with the civil sector wherever possible so as to enhance the contribution of its research programmes to wealth creation in the economy as a whole.

The White Paper stated that the DRA was establishing a strategy for its relationship with industry which would encourage the transfer of technologies. It would develop the non-Governmental use of its facilities to undertake profitable ventures and would vigorously pursue the commercial exploitation of technology generated within the Agency to maximise its royalty income. Progress in implementing these objectives will be reported in the 1994 Forward Look of Government-funded Science and Technology.

The DRA has a number of enabling mechanisms intended to support technology transfer for both military and civil purposes. Three important initiatives are currently being pioneered by the DRA, namely: the Pathfinder Scheme (now well into its second round), the Strategic Alignment initiative (now in its second year) and the proposed Dual Use Technology Centres (the first to be estabished in Structural Materials in April 1994). The DRA's Annual Report will in future monitor progress in transferring its expertise to industry and will provide a benchmark against which future performance can be measured.

All of these recent changes represent a continuing development from the position which was obtained at the time the Levene/Stewart report was prepared.

7. *Para 1.36 of the Levene/Stewart Review recommends that DRA, MoD and OPSS should "take stock of the Agency's relationship with MoD at the time of the DRA's Framework Document Review in 1997" with a view, inter alia, of examining "the potential to privatise all or part of the DRA". Is full or partial privatisation of the DRA still on the agenda following the White Paper?*

The situation remains as set out in paragraphs 5.12 and 5.13 of the White Paper. Following exchanges last year between the Secretary of State for Defence and both the Chief Secretary to the Treasury and the Financial Secretary, Treasury, MoD is committed to a review of the DRA's future (including privatisation) after five years as a Trading Fund.

8. *Concern has been expressed to the Sub-Committee that, in applying competition policy to DRA in an effort to cut costs, relations with industry might be damaged. There is concern that what DRA learns about firms in its role as adviser to MoD (eg detailed cost structure information) could be used against firms in the competition/market testing environment. On this view, firms are unlikely to engage in the relatively free exchange of, often sensitive, information with DRA that characterised relations with DRA's predecessors. Accordingly, the attempt to increase the efficiency of DRA, and to cut its costs, may counter-productively impede the flow of information to MoD, and reduce the scope for DRA and firms to relate harmoniously in the wider national wealth creating process. Does OST have a view on this question from the perspective of its responsibilities for the relation of science and technology to wealth creation?*

The DRA attaches tremendous importance to the protection of information that it gains from industry through collaborative and co-operative arrangements and has made it quite clear to its industrial colleagues that they have nothing to fear from the possibility of that information being used against them in a competitive situation. The arrangement of 'Chinese walls' that the DRA has in place to ensure the complete separation of those of its staff involved in competitions from those who might be involved in judging them are perfectly familiar to industry, who use a similar device themselves for precisely the same prupose. If, however, industry needs further reassurance, they may take comfort from the elaborate arrangements that the DRA has set up in the shape of its 'Ombudsman', who is there to investigate specific complaints; and from the Market Testing Review Board, which has a majority of non-DRA members and is there to look into the running of the market testing and secondary competition programmes.

Industry's concerns may be based more on a fear of the unknown—fuelled by past uncertainties as to how precisely the DRA was going to operate—than on any specific examples of the DRA's letting them down. The DRA has put a lot of effort into trying to reassure industry; when competition really gets going we would expect industry to find that their current fears are unjustified.

9. *DRA controls many expensive facilities for which only part of the costs can be recovered from customers. Where MoD perceives a long term need it can fund the DRA to maintain these facilities. If there are no long-term defence needs, but these facilities are of use to non-military parties, will they continue to be funded by government, and, if so, by which departments?*

DRA is looking to increase the utilisation of all its facilities, but if MoD had no requirement at all—present or future—for an expensive facility, DRA would seriously consider giving it up because its primary mission is to support MoD. This would be particularly true if a facility offering a similar or comparable service existed elsewhere, otherwise industry might grumble at the unfair competition.

Non-military customers of the DRA. including other Government departments, would be expected to pay the full economic cost for use of the facility under a normal commercial contract. It would be a matter for any commercial customer to enter into dialogue with the appropriate Government department if a subsidy were required.

10. *The Framework Document requires the DRA to maximise their income. If the DRA were able to sell or license IPR abroad for a greater sum than it could achieve in the UK it would be required to do so to the detriment of the UK economy. How should this be rectified? Would it be by changing the Framework Agreement, or by financially compensating the DRA for "backing the UK"? If the latter, which Government Department would provide the necessary finance?*

The DRA has never so far been faced with such a dilemma, and cannot envisage the sort of situation arising where it would sell its IPR to a foreign concern in direct preference to a UK firm. If it did happen, then no doubt a decision would have to be taken at the time, taking into account the views of all interested parties, including the OST, DTI, Treasury, MoD and DRA.

Examination of witness

Professor Sir William Stewart, FRS FRSE, Office of Science and Technology, called in and examined.

Chairman

648. May I welcome you, Professor Stewart. We are very pleased that you can join us once more. As you know, we are about three parts through an enquiry into the Defence Research Agency and your office has kindly answered a number of questions which we put to you and we should like to follow this up perhaps by having the benefit of your advice on a number of further points. In very general terms may I ask first of all, Professor Stewart, whether you would like to comment on the scale of the challenge facing the Defence Research Agency in the light of the need for change and how you feel that these changes are being managed and to what extent they have been successfully managed?

(*Professor Stewart*) My Lord Chairman, may I first of all thank you for the opportunity to be with you today and to say a few words. I welcome the fact that your Lordships are addressing the question of the Defence Research Agency because it impacts on the work of the Office of Science and Technology and of government in general. This is a major sector which is of importance for the country as a whole, for the defence of the realm, and for the science and technology base in this country. As one looks towards the future there is an enormous challenge ahead. We have to address that in several areas. First of all, my Lord Chairman, it seems to me that at the end of the day the Ministry of Defence's job is to defend the realm, the Defence Research Agency should help them to do that in the future and we have to see how it can do that in a the changing world.

649. A lot of these changes were proposed in the White Paper, Realising our Potential, were they not, and are you encouraged or otherwise by the progress which has taken place with the publication of this White Paper?

A. I think the question that has been asked is whether the Defence Research Agency has been fully integrated into the overall policy that has been set by the Government. We decided in the run-up to the White Paper that a lot had to be done across the totality of science, and engineering and technology, on expenditure, and where priorities had to be set. The DRA was in the process of change, they had a lot of work in hand, and in the run-up to the White Paper we were not particularly concerned about the DRA. The Ministry of Defence had set up the Defence Research Agency, and they had a very able chief executive in the form of John Chisholm. He was bringing a welcome structure into what had been a vast conglomerate. He was focusing, rightly in my view, as a scientist, on the need to rationalise, to reduce numbers, while at the same time ensuring that the balance shifted towards the maintenance of high quality, innovative and leading edge science. That must be right for the Defence Research Agency. That is where the shift must go in my view. We need superior technology and equipment at the end of the day to win the day. We need an increasingly scientific and technologically literate component to address issues such as procurement and we believed that John Chisholm was going about that in the right way, in an impressive way, in fact. The question was: why interfere at an intermediate stage of what was going on? I hope that you will agree that that was the right way to proceed. In relation to the discussion that we have had about the interaction between publicly funded science and technology generally and the role of the Defence Research Agency, our role at the centre is to have an oversight of where science and technology is going. If there is one thrust that we seek to achieve it is that. Come what may, the United Kingdom looking to the future, must seek to ensure an infrastructure for science and technology that will serve us well. Increasingly we have closer interaction with the Ministry of Defence and, of course, with the Defence Research Agency. For example, I sit on DSAC, the Defence Science Advisory Committee, the Ministry of Defence sits on EDS(O) which is the official committee that I chair, I meet with the Chief Scientific Adviser of the Ministry of Defence two times a month, I visit MOD laboratories, I produce papers for the Ministry of Defence, and we have organised joint meetings. We are not concerned that the DRA does not appear to be involved with us. We know well what the DRA is doing and we work closely with them.

650. You refer to the infrastructure for the science base. May I ask what the reason was for the scrutiny exercise on the research establishments? The DRA establishments have been exempt from that scrutiny exercise, have they not? Could you tell us why that was, Professor Stewart?

A. I think basically for the reasons that I have just given, my Lord Chairman, that the Defence Research Agency was in the middle of a big exercise of change and John Chisholm was there to carry that out. Once it was decided what he had to do, and that had been set in motion, it was sensible in my view to allow him to get on with that job. I do not think that we want unnecessary turbulence. There is nothing worse than being given one remit and being asked to get on with it and five minutes later you come along and you ask for something else to be done. We were quite clear in relation to the Defence Research Agency, we were content with what they were doing, there was a lot to be done and we should let the DRA and John Chisholm get on with that. In relation to the totality of government departments, especially on the civil side, I think that there is an appreciation, as one looks towards the next century that the global scenario is changing. We have the end of the Cold War. The pace of technological changes is escalating,

[Chairman *contd.*]

it is moving ahead at an enormous pace, and here we have in the United Kingdom and, indeed, elsewhere a set of structures that were set up a long time ago. I think it is reasonable to ask, looking to the future, whether we have the right set of structures or not. What Government had done was to look at science and technology policy overall. In the schools there is now a national curriculum, with science and technology from 5 to 16. We have just been through a restructuring of the research councils and I think that, by and large, that has been fairly successful. John Chisholm has been given responsibility for taking the DRA forward. There are the universities where three higher education funding councils were set up. The one area that had not been addressed in any great detail was whether the structure that was available for the government research establishments was optimal. The efficiency team of Sir Peter Levene has been asked to do that as part of a normal Efficiency Unit scrutiny exercise and that is in process. It is a question of addressing each of the main areas one by one.

Baroness Platt of Writtle

651. You very rightly emphasised obviously that the first responsibility for the Defence Research Agency must be to the Ministry of Defence for the defence of the realm. Your paper places your emphasis on wealth creation. The mechanisms within the Defence Research Agency are all on reducing net expenditure, which is obviously a Treasury aim. It obviously equally can be a conflict. If you are going to try to have dual use technology, spin-off into the civil sector, however you like to suggest it, in order to improve wealth creation that may not actually in the first instance reduce net expenditure, and I have wondered during the time that we have been questioning people whether it would not be a sensible idea for the Office of Science and Technology to have an input into the Defence Research Agency so that it had an actual responsibility not just as encouragement, as you put it in your evidence, but an actual responsibility for wealth creation in the private sector in this country in line with the White Paper.

A. It is a difficult question, my Lord Chairman, but basically at the end of the day unless this country generates wealth we will not have anything.

652. That is right.

A. We have to generate wealth whenever it is sensible to do so. The question is, to what extent is it sensible in every case. I still believe that, in relation to the defence of the realm, the Ministry of Defence needs access to the type of organisation that the Defence Research Agency is. Superimposed on that, how does one involve the skills and expertise, the facilities, the resources that the Defence Research Agency has, to foster wealth creation in concert with industry. The Defence Research Agency offers several areas which are of great interest to OST. First of all, my Lord Chairman, it has a very able intellectual resource base and at the end of the day bright people are going to be the answer to many of the things that we need. Secondly, it has a group of facilities which are irreplaceable and which the United Kingdom needs for the future. Thirdly, it has to develop an interaction with industry to make sure that we get hybrid vigour, if you like, out of what the Defence Research Agency on the one hand can offer through its skills, expertise, and facilities, and what industry can offer. We must see how we can maximise the opportunities, the facilities, the resources, that we have, and that, of course, my Lord Chairman, is a very difficult thing to do. At this stage there is tension perhaps, or there can be tension, between what the private sector is doing and what the public sector is doing and what is the optimum interaction. We have to resolve that.

Lord Porter of Luddenham

653. My Lord Chairman, I should like to ask Professor Stewart, coming back for a moment to the scrutiny of public sector research establishments, whether he shares the concern that has been expressed in so many quarters about the time available for the examination of over 50 very diverse, large establishments, their whole future depending on the conclusions, which has to be—unless this has been changed—decided by the end of this month. He will know, I am sure, of the expression of concern from the Royal Society and the talk which the parliamentary Select Committee on Science and Technology had just before the recess with Sir Peter Levene when they were by no means reassured by what Sir Peter said. Is this not just too short a time even to make preliminary recommendations upon 50 different important establishments?

A. Through you, my Lord Chairman, I agree with Lord Porter that it is a very major task. In respect of each of these research establishments we do have visiting groups going to them and there is knowledge of what each of the particular institutes is about. The Levene scrutiny study is concerned with whether the management of these systems is optimally organised or not. My own view as a scientist is that you cannot totally divorce management from science, and I am standing back to wait and see what the report says. The report will eventually go to Mr Waldegrave, the Minister for Science, and he will consider it and no doubt he will consider inputs from various other sources as well. As the Chief Scientific Adviser, I will want to offer advice on the most appropriate way forward.

654. It is difficult because while one wants to and one must have the time for a proper survey, if that time is extended then of course all the establishments until they hear some comment are in limbo. There is nothing worse for an establishment than to wait to hear whether it is going to be privatised or whatever. Will there be some attempt at least to satisfy the majority of them where no change is necessary, to let them know fairly early, while others which are more difficult perhaps are delayed for further consideration?

A. Through you, my Lord Chairman, some establishments are exempt at the present time. Not all are being considered. I agree that examination and uncertainty is very worrying to the scientist on the ground. As I said in this room before, you cannot switch science on and off like an electric light bulb. You have got to try to get some vision, you have got to take some long-term decisions on where we are

[Lord Porter of Luddenham *contd.*]

actually going. There is a conflict. If you do it quickly it is said: well, you are doing it too quick, and if you take too long, it is said: well, you are taking so long that there is unacceptable uncertainty. I'm quite clear about the scrutiny report. The scrutiny report is about the management of research establishments. The future of the UK R&D base, I suggest, should not be determined totally on the basis of management. There will be other inputs made to the Chancellor. The Chancellor will have to take the inputs that he gets on management together with the other inputs and take a sensible decision on the way forward.

Lord Trefgarne

655. My Lord Chairman, I should like if I may just to develop the point that has been made by Lady Platt. We have seen that the Defence Research Agency is of course a creature of the Ministry of Defence; the great majority of its funding comes from the Ministry of Defence, a certain amount comes from the Department of Trade and Industry and a smaller proportion still comes from commercial customers. I am not quite clear what the relationship between the Office of Science and Technology and the Defence Research Agency is, whether the OST is presiding over our science and technology activity generally, what their injection into the Defence Research Agency would be given that the DRA is a substantial proportion of our national research capacity.

A. The role of the Office of Science and Technology at present is a strategic one at the heart of government. Its role has been to develop strategic thinking across government departments on a trans-departmental basis and in co-ordinating government policy. We have a specific remit to ensure that government expenditure on science and technology is targeted to make the maximum contribution to our national economic performance, to quality of life and to the specific missions that each of the departments have. You have to look and see where we were two years ago. Two years ago there was no Office of Science and Technology, and there was not such a good co-ordinating role. We are at the early stages of strengthening coordination. First, we had the Government's White Paper on science and technology. Secondly, we are about to produce the Government's first Forward Look—I have the proofs of it here, and it will be published next week. It is not a slim document. In it we have tried to address, across government departments, what each government department is doing today and how it proposes to take policy forward. There is a good piece in the Forward Look from the Ministry of Defence and from the Defence Research Agency. You may have said that there was not very much from the MoD in the White Paper. We have moved on since then. The Office of Science and Technology is also taking forward the Government's Technology Foresight programme, the restructuring of the research councils, Women in Science, research priorities in human genome research, company structuring of LINK, etc. We are looking at broad policy and within that the Defence Research Agency is no different from any other institution. We will be involved in working to ensure that the Defence Research Agency fits into overall policy and that there is an infrastructure available to take the United Kingdom forward positively for the future.

656. If I may just follow that up, my Lord Chairman, moving from the general to the particular, we have heard that the Deputy Chief Scientific Adviser has a specific task to generate strategic research within the Defence Research Agency; a small proportion of their activities is involved in that. Do you have any input into that, do you decide with him what might be a suitable piece of strategic research to go on in the Defence Research Agency?

A. My Lord Chairman, the answer to that is "no" today. We are setting up a new structure with the Forward Look, to expose readily what the specific programmes of particular funded bodies are and will be. The Forward Look, as policy across the totality of government will set out there what particular cost centres are going to do. In years to come we will be looking to see whether or not these agreed policies have in fact been implemented. As the Chief Scientific Adviser, I try to look at things in the broad. There is a Chief Scientific Adviser in the Ministry of Defence at the present time, these are a lot of scientists in the Defence Research Agency and in the Ministry of Defence. It would be quite wrong for me to try to get down to the level of specific programmes.

Lord Craig of Radley

657. It may in fact be covered in your work, Professor Stewart, but if we start with the proposition that the Cold War was a research driver is it the view of the Office of Science and Technology that the thrust towards new scientific frontiers, if I may put it in that way, will persist as strongly in the post-Cold War era, particularly bearing in mind that there will inevitably be fewer defence funds available for research?

A. My Lord Chairman, if the Defence Research Agency and the Ministry of Defence are not at the forefront of new scientific frontiers then I worry over the future defence of this country, so the answer to that is, yes, I very much hope that there will be. We get then into the broader area of whether the scientific frontiers which are needed for the defence of the country in the future can be separated into what goes in the civil sector. My view as a scientist is that what we need in this country is a strong, flexible innovative science base which will pick up things whether they are in the civil sector or whether they are in the defence sector. Then you ask, how do you prioritise, how do you deliver the objectives that are set. One of the things that we have been trying to do again, my Lord Chairman, is to get a more consistent view of what the longer term objectives for this country are; and then, how do the various components of the publicly funded science and technology base fit most effectively into trying to deliver these. But that is a long way round to answering, yes, I think that a strong, innovative science base must always be part of the Ministry of Defence's armoury. Whether they have to own the resources to deliver is an interesting point, my Lord Chairman.

Chairman

658. You refer to the Forward Look document, Professor Stewart, and clearly that will advance this debate presumably, but you say that it is a long-term objective. How long are we talking about before you can achieve what you require to integrate these different departmental programmes?

A. It depends on what resources you have available to do these things, my Lord Chairman. Basically I cannot answer the question in terms of years, but I have several concerns. One is that we must not go on having turbulence all the time. We have to decide what we do, resolve the simpler specific areas one by one—get these sorted out. We then have to take other complex areas and deal with these comprehensively. The time frame depends on so many factors, not least on the resources available and the will and commitment of different bodies to go down the roads which have been agreed.

Lord Dainton

659. Professor Stewart, I should like to come back to this (in my view) really rather central problem which has already been the subject of questions from other speakers, and that is: here one has in the Defence Research Agency a body which has a two-fold task. The first one is of course, as you have said, the defence of the realm and from the way in which you expressed it I imagine that you would take that as being the prime purpose overriding everything else. The second is how to get the skills and the knowledge there into industry to fulfil what is more centrally your responsibility, which is the wealth creation aspect. Now the trouble with that, it seems to me, and I should like your comments on this, is first of all that bodies which have a dual mission of this kind sometimes can get out of focus. They are not sure at a particular time who should have the prime responsibility and the prime priority. Secondly, the question that worries me about the particular thing in relation to the Defence Research Agency is that whereas it gets funds from the Ministry of Defence for the prime purpose, there appears to be no particular provision for the other purpose. How is that to be funded, and particularly bearing in mind that this problem is a problem that is faced by other countries and other countries, as I understand it, where they are trying to get out of the defence skills into industry do have extra funds to enable them to do it? How is that problem, if it is real, to be tackled?

A. It is very difficult, I agree. There are two things. First of all, the Defence Research Agency is in an evolutionary stage. It has numerous research establishments around the country. There are a lot of resources dissipated and it is a question of getting a more efficient, slimmer organisation set up which has science and technology high on the agenda for all the reasons that we have talked about. I believe that the Defence Research Agency did obtain some funds to bring that about. Also, as a trading fund it is possible to recycle some of the resources that are released as a result of rationalisation. My own view is that the Defence Research Agency is one component of the totality of the UK science and technology base and that, while one can do a Rolls-Royce job on any research establishment given the funds, we do not have the funds to do a Rolls-Royce job on every research establishment. So it is a question then of making the best use of the resources that you have got, to get priorities set across the whole of government on where the most important areas are for the future, to focus on these and to get them sorted out. I should not want to say that you necessarily do it on the Defence Research Agency as the top priority without asking what needs to be done in various other sectors—what do you do about the universities, what do you do about the research establishments, all of this. The first thing to do is to get the Defence Research Agency to bring about the slimmer and efficient organisation which it is possible to achieve in this country without losing the important work that it does. That has got to be done within the resources that it has at the present time. Thereafter you look more carefully at how you interact more closely with industry. I think that the Defence Research Agency, pointing in two directions as it does, has a very difficult furrow to plough. It is no bad thing from a Ministry of Defence point of view, of course, to have an organisation which knows inside what is going on and which again from a defence point of view can see what is going on in the the world outside. There needs to be a mechanism whereby the Defence Research Agency has a clear set of common objectives with industry if it is going to be associated with them and, that clear set of common objectives having been established, then to come forward in a way that protects what the Ministry of Defence needs on the one hand and what industry needs on the other. I do not think that the precise details of that are yet worked out. It is something that needs a lot of attention.

Baroness Platt of Writtle

660. Could it go into the framework document for the Defence Research Agency?

A. Yes, I believe that it could.

Lord Dainton

661. One difficulty about that, of course, is that the industry where the Defence Research Agency's technique will be particularly valuable in generating wealth is in fact that kind of industry which will itself be bidding for provision of, for example, weapons to the armed forces and therefore there will be a sense of competition because the DRA's other function is to advise Government about procurement. I should welcome your comments on that. I should also like to ask whether from your overview position, seeing the whole of the picture of British science and technology, if you saw an area in which from your knowledge of the DRA's capabilities it could materially assist industry in a particular, it would be possible for you to indicate to one body—it might be a research council or it might be a government department—that really they ought to go to the Defence Research Agency and put work with them. That would seem to be a very practical way of implementing government policy.

A. Through you, my Lord Chairman, if I may take the last point first, I think it is essential for the future, that there has to be an organisation such as the Defence Research Agency which has unique resources and facilities to help UK industry, to help UK science and technology, and I believe that should

[Lord Dainton *contd.*]

be provided by and supported by the public purse. In relation to the usage of these facilities by different sectors, whether that is the defence industry or whether it is a research council or whatever, the DRA should operate as a research hotel to which outsiders contract to go and work for particular periods, get the interchange of views across the defence/civil sector and, having done their work, used the facilities and had the interchange, they move out again. They may come in and use something else in the future when the facilities and the resources of the Defence Research Agency can be helpful. Some of the resources that the Defence Research Agency has cannot in the future be justified on the basis of defence expenditure only, and the question is, how do you sustain them in a way that is cost effective and sensible. The Defence Research Agency should sustain the unique facilities that it has and the whole UK S&T base should be able to buy into these.

662. And as to the point of competition with the defence industries?

A. That is a very difficult one, my Lord Chairman. I can see the concerns of industry on the one hand and I can see the needs of the Ministry of Defence on the other. My view is that it should be left to the private sector to negotiate. I can only generalise in these broad terms at the present time. How the issue will be taken forward will depend on the particular circumstances of the industry, the research and the product. It is also very important that the intellectual property is sorted out at a very early stage so that one knows precisely where one is, and only after that is sorted out does one take things forward. I am concerned about that because, as you know, my Lord Chairman, the defence industries of this country are no longer national industries; they are multinational industries. That is why one has got to be wary. It is a difficult and sensitive issue and I do not have a complete answer to it.

Chairman

663. Professor Stewart, I wonder whether I may come back to this interaction of the Defence Research Agency with civil markets and remind you of the most helpful observation that you and Sir Peter Levene made in your review of last year at paragraph 1.55.[1] You said, "We recommend that the DRA should aim and be allowed by the MoD to become very much more involved with civil markets than is presently envisaged and that to this end the agency should market its skills more widely and actively in order to realise more of its commercial potential." Is there anything that you feel that this Committee could do to help advance the debate? You acknowledge that the Defence Research Agency's management has made considerable progress, but I suspect that there is a certain degree of rigidity which somehow has to be resolved. Is there anything that you would like to suggest to us that we should address?

A. My Lord Chairman, I think that it is important to look at what is going on in the rest of the world. If governments only did that—and I am sure that they do—then I think that they can learn a great deal. You can take, for instance, the USA example of the DARPA/ARPA. I have heard it said about the American situation, I think it is Brownstone and Park who call it "the American propensity for pragmatism in government". Clearly as one looks to the future, as we have said earlier, the distinction between civil and defence scientific infrastructure is dissolving. Any encouragement that can be given to open up the resources that we have in the Defence Research Agency will be enormously helpful. In relation to more general issues, the Office of Science and Technology in its co-ordinating role must interact very closely with big spenders, and the DRA in the Ministry of Defence is a big spender. It is important to look at the totality of the UK S&T base, the amount of money we put in, where it is being spent and how can we further promote the policy, which I think is a successful policy, of trying to look broadly at the future from the centre to make sure that we have the infrastructure for the future that we did not have a few years ago.

Lord Craig of Radley

664. May I just ask a quick question here, my Lord Chairman, in connection with this. With regard to the document that you put your hand on which is to be published next week, will that contain the kind of data that one needs as an outsider to be able to look in and analyse some of these relationships about spend and responsibilities and who pays for what?

A. That is the ultimate aim of that document, my Lord Chairman. We have got to appreciate that this is the first time that this document has been produced. Basically it has been produced in rather a short time. I think that it was not usual in the past for information of this type to be so readily available within one document. What we want to do is to build on it so that each year it will become more apparent to your Lordships, to the public, to the taxpayer and to the scientists at large what the resource of the United Kingdom is, where our strengths and our specific expertise in different areas are, what particular sectors are good, and then I hope that we can move towards something that I think the Japanese do rather well but we do not do quite so well, that is, to get some consensus on the best way forward for the United Kingdom and have some national vision. If the Office of Science and Technology can help on that—and I believe that it can help—then I believe that it is a move in the right direction.

Lord Howie of Troon

665. My Lord Chairman, perhaps I may return to the question of wealth creation and so on. The Ministry of Defence is the owner of the Defence Research Agency and also its major customer and it has very specific priorities of its own, and it would seem to me that it would be very naturally biased towards defence rather than the generality of wealth creation. You spoke, Professor Stewart, of working along the lines of agreed strategies, I think. That is my recollection, anyway. You also spoke a little bit later on of the Office of Science and Technology

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[1] Review of Allocation Managment and Use of Government Expenditure on Science and Technology, Cabinet Office (OPSS), 1993.

[Lord Howie of Troon *contd.*]

interacting with the big spenders, of whom the Ministry of Defence is one. Were you indicating to us that the Office of Science and Technology is able to apply some specific leverage on these big spenders, including the Ministry of Defence, or were you saying that in reaching these agreed strategies you were really in the position of what used to be called once upon a time an indicative planner, if you remember the term?

A. The Office of Science and Technology in a sense does not have very much power. I think that the Office of Science and Technology has some influence, and influence is always a useful thing to have. Basically the influence that we can exert is that we can get co-ordinated agreement from departments on where they think that they are and where they think that they are going. That is helpful. Secondly, in relation to discussions in regard to the total expenditure on science and technology the Chief Scientific Adviser has a specific remit to advise the Government generally to let them have his views on particular areas. The Chief Scientific Adviser also has the opportunity of direct access to the Prime Minister on expenditure in specific areas. I think that it would not be a very sensible Chief Scientific Adviser if he did not make use of these opportunities. That is what I try to do.

Lord Howie of Troon] And then your advice is taken, of course, when it is good!

Chairman

666. I wonder whether I may move back now to the questions that we have put forward dealing with LINK and Technology Foresight. I refer to LINK specifically first. I wonder whether you could help us, Professor Stewart. LINK is now, as I understand it, the responsibility of the Office of Science and Technology and here you have not just influence but responsibility, so how would you like to see the LINK scheme develop specifically so far as the Defence Research Agency is concerned? Does the fact that the Defence Research Agency is a trading fund have any bearing on this?

A. My Lord Chairman, the Office of Science and Technology, as you have just said, has the responsibility for LINK, and I think that that involvement with industry complements the greater involvement of able industrialists with extensive experience of science, engineering and technology in the Office of Science and Technology. We have, for example, John Cadogan, Director-General Research Councils, an able industrialist; we have Alan Rudge, the chairman of EPSRC; we have Peter Williams, the chairman of Oxford Instruments. The involvement of these industrialists and outstandingly able scientists is the sort of thing that the Office of Science and Technology is trying to do. There are several other things that we are trying to do. One is the Technology Foresight programme, to which we will perhaps come back, my Lord Chairman, and then the research councils' ROPA scheme. Then there is this question of the LINK mechanism. The LINK scheme basically is an umbrella mechanism for bringing scientists, engineers, technologists and industry together. What is new about it at this stage, I suppose, is that we now have a new and very able chairman of the LINK steering group in the form of John Parnaby from Lucas who has just taken over the chairmanship of that. Secondly, there is a view across government departments that more than ever before departments who have been little involved in LINK hitherto will become more involved in it in the future. What we are doing at the present time together with other government departments is to review how to take LINK forward. If I do not give you an up to date answer as to how we specifically intend to take it forward at the present time, my Lord Chairman, it is because we are currently deliberating on that and we expect to relaunch the new LINK programme later on, probably before the summer recess. We will take forward, I hope, a variety of new initiatives which might help to make LINK more useful to industry and to others. For example, we have already decided that we can have single company/single research base interaction rather than requiring the multiplicity of departments and companies. We will have single departments, single research council sponsorships. We will have a broader spectrum of government departments involved. We are developing good links with the Department of Health, with MAFF and with others and we expect closer coupling, looking to the future, between the LINK scheme as an umbrella organisation and the outputs from the Technology Foresight exercise. The LINK scheme, for example, might be a useful way of taking forward and implementing some of the findings that come out of the Technology Foresight exercise while leaving the research councils to get on with the basic science that they are good at. We are going to pilot one or two schemes using, for example, the CEST-type of technology foresight exercise on the environment. We will try to use a LINK scheme to pilot how that might be taken forward before first phase of the Technology Foresight programme is completed of it, by the spring of 1995. We are reassessing LINK therefore and we will announce how we intend to take it forward fully before the summer recess, and we are talking to the Defence Research Agency about how we might involve them more fully in the future and take up some of the concerns that they have at the present time.

Chairman] Does anyone want to come back on the LINK scheme?

Lord Dainton

667. Perhaps I may ask a question, my Lord Chairman, which really goes back to this, as I see it, crucial matter of how to get DRA expertise into wealth creation. Professor Stewart, you did say at some point in your evidence that you saw encouraging signs of this already happening, but I think that we have got no feel in the Committee as to what those encouraging signs are. Could you tell us what they are? It will be very relevant, I think, to one's look at how the Defence Research Agency might operate in the future.

A. No, we did not have anything particular up our sleeve. We thought that areas such as Pathfinder and dual use technologies and that type of issue were actually a move in the right direction.

[Lord Dainton *contd.*]

668. But it has not really solidified into concrete examples yet?

A. No, not yet.

Chairman

669. The Committee noted with interest the research centre being set up at Farnborough by the Defence Research Agency, the structural materials centre, which as I understand it links industry, the Defence Research Agency and academia. Is this something that the Office of Science and Technology has had any involvement in and will have in any such future DRA centres?

A. My Lord Chairman, no, we have not been specifically involved in that other than saying that that is the type of thing that we believe is a good thing, that departments, agencies and others have got to come up with ideas on how they can better use the resources to help wealth creation. I believe that it is then up to the organisations themselves to decide how they best address that with the facilities and resources that they have available. All we should say is that we welcome it, we give it our blessing and we hope that this is the sort of thing that can be generated more widely across research establishments.

Lord Porter of Luddenham

670. I wonder whether Professor Stewart could say a word about the Technology Foresight exercise and how it is progressing, particularly how the Defence Research Agency are going to be involved in this. It has been put to us in this Committee at an earlier meeting, and I think that the Chancellor himself subscribed to this, that perhaps the main benefit of the exercise will be in the process rather than the conclusions, that is to say, the process of bringing together academia and industry in itself would be valuable although the conclusions perhaps not so much. The question I should really like to hear you speak about is, how do you see, assuming that the exercise is progressing well, the conclusions being implemented, or is it really the process that matters?

A. My Lord Chairman, maybe I might say just a few words about how the Technology Foresight exercise is progressing and then lead up to the specific question that Lord Porter has asked. First of all, the Government did announce that it was going to have its Technology Foresight programme; and secondly, it is not an OST programme, it is a government-wide programme which the Office of Science and Technology is managing on behalf of Government. I think that that is an important point to make. The Chancellor, Mr Waldegrave, was very keen that we should go ahead with the Technology Foresight programme. There are several points about Technology Foresight. It is used by most of the better major companies in the private sector. The time frame varies, of course. Some go over a few years, and maybe that is not foresight as I see it. Some take a longer term view. Some of the Japanese take one hundred year scenarios. There is a broad variability. The point is that the private sector who have to live in the harsh global arena have been doing it in various ways for a number of years. Secondly, we have the smaller companies, and the smaller companies cannot afford to do it. Thirdly, we have the public sector which are using taxpayer's money and they have not been thinking about it very hard at all. Our view is that we must not just bounce on, we must not develop things by a series of knee jerk reactions but we really ought to accept that we cannot do everything, that we need some longer term thinking that must go into our deliberations. That longer term thinking should not be done by a few bureaucrats in the Office of Science and Technology or anywhere else. We must engage the community, we must engage the scientists on the ground and we must engage industry and marketing people and listen to their views. We in the OST are the facilitators. What the Office of Science and Technology did therefore was to go out to the community and ask for their views on how this programme should be taken forward. We did not go to one man and we did not go to one woman or ten men and ten women; we went out to the breadth of that community and we said: look, we are going to do this, how do we take it forward positively. What OST has done is to collate that information and there has been overwhelming support for the programme. I think that Sir Dai Rees summed it up when he said: for goodness sake let's give this a chance, we're not so brilliant in the United Kingdom that we do not have to tap all the best brains that we have in this country. That was why we decided to take forward the Technology Foresight exercise. Secondly, we also thought that we should take it forward on a broad base, that we should cover the waterfront, because if we did not do that we were actually prioritising before we had started. Importantly many of the interesting areas are areas at the interfaces between different sectors. Thirdly there was support for us giving equal weight to technology push and market pull. Fourthly, we asked the community for the names of people who would be most appropriate to serve on the panels, etc. We have a database now of about 10,000 people. There is a lot of interest in this. When the panels are announced it will not necessarily be the conventional members of committees of the past. We are hoping to bring in the people who are emerging on the scene, some of the younger people, some clear-thinking industrialists and others. We are trying to elicit a broad understanding of the United Kingdom position in various sectors, set that against what goes on in the international arena, the position of our competitors, where our strengths are, do we have the infrastructure and, if we do not have the infrastructure, how do we get the infrastructure, etc, etc, and we are going to ask these panels to come back with broad proposals. We are at the stage in which we have announced the panels that we are going to set up, we have announced the chairmen of the panels that we are going to set up and probably tomorrow, or maybe it will be Monday, we will announce the panel members. Once the panels are set up it will be for these panels, and particularly the chairmen, to drive the process. They will go out and they will interact with the community and they will interact with the professional bodies relevant to particular sectors. For example, we have a chemistry panel. It would be nonsensical for us not to interact with the Chemical Industries Association and various others.

[Lord Porter of Luddenham *contd.*]

These panels led by their chairmen are already beginning to operate. What we will do now is to let the panels go on and bring forward their initial views, and then probably at the start of the summer recess or shortly thereafter we will collate these views and again go to the community and see what the community think about them. It is likely that the panels will also set up sub-panels at interfaces. By the end of the year, my Lord Chairman, to get to Lord Porter's question, we will have a view on broad areas where the United Kingdom really must have sustained competence if it is going to compete. As we look to the future, priorities will have to be set. The question then is, having decided on what some of these broad priorities are, how much preference will be given to these areas rather than to other areas and brilliant science. My Lord Chairman, I believe that the interaction with the community is important, but I do not think that there is any sense in going through the whole of the Technology Foresight exercise and saying: we are only doing it to get better and closer interaction with the community. We cannot do everything. If we are going to prioritise in some areas we had better do it on the basis of widespread consultation, and when priorities are set at the end of the day these priorities will be based on the advice of the scientific community and industry itself.

Baroness Platt of Writtle

671. Will that be a rolling programme? You cannot set it in tablets of stone, can you?

A. No. Basically the interesting point will be after these reports come in from the sectoral panels. It is clear that you cannot change the whole system overnight and one would not want to change it overnight even if one could; in fact, one would not want to change it radically even if one could. We will then say: here are some areas of priority for the United Kingdom, we should be looking to see how we can best take these forward, accepting that one cannot do everything at once and accepting that, as always, the decisions on what specific science is done in these areas will be agreed by the scientists on the ground and agreeing also that if there are shifts towards these priority areas they must be done in a very sensible way. We must not have radical shifts because at the end of the day the scientists on the ground, whether they are in these areas or not, will be the people who will keep the research base of this country going in the future. If I may give you an example, my Lord Chairman, the Dutch, who did a short Technology Foresight exercise came to the conclusion, if I remember correctly, that they might shift around 3 per cent of the resource per annum towards priority areas with the other 97 per cent left as it was. It is a question of what percentage one might put into priority areas via the research councils, which I suspect is what Lord Porter is concerned about, or whether it is done using the LINK scheme and other schemes which we already have with industry.

Chairman

672. Looking at the list of panels, Professor Stewart, of which there are 15, it is clear that the Defence Research Agency would be particularly interested in defence and aerospace, but there are also to be panels on information technology and electronics, materials, communications and a number of others which I can quite see will be relevant to the Defence Research Agency. Would it matter particularly if these different panels strayed on to each other's territories?

A. I think that it would matter if they did not. I think that is the important point: interaction and interfaces are going to be what it is all about. I hope that they will stray on to each other's territories. At the present time some of the panel chairmen are setting up interactions between their panels. In relation to the participants on the Technology Foresight panels, I do not really care whether they come from the Defence Research Agency or whether they come from the Highlands and Islands Tourist Board so long as they are the best persons that we have got in the United Kingdom and we get their skills and their expertise interacting and helping to take forward what I think is a very important area for the future.

Chairman] I am sure that you will make sure the Highlands and Islands are well represented, Professor Stewart. Are there any other questions that members of the Committee would like to put to Professor Stewart? I think that we have pretty well covered in a rather random way the matters that we suggested we were going to put.

Lord Trefgarne

673. My Lord Chairman, if there is time left, I wanted to ask Professor Stewart about the present relationship between the Office of Science and Technology and the Department of Trade and Industry. The Department of Trade and Industry we have had evidence from, of course, and we may hear from them again, but they seem to have a slightly anomalous relationship with the Defence Research Agency which we may, I dare say, come to comment on in our report in due course, my Lord Chairman. I wondered what input you have to the Department of Trade and Industry's thinking, Professor Stewart, which they in turn might relay to the Defence Research Agency?

A. I think that the answer, my Lord Chairman, is that we work extremely close and well with the Department of Trade and Industry. Let me say that we are trying to make sure that we get closer interaction with industry within the Office of Science and Technology. We are building that up in a way that we perhaps have not done hitherto. I think that that does not necessarily interfere with what the Department of Trade and Industry is doing. It is certainly my personal belief that, as we look forward, the interaction between basic science and the needs of industry is going to become closer and closer and the time frame for that interaction is going to become shorter and shorter. The Office of Science and Technology in doing its job must have closer interaction with industrialists. That we need and that has been achieved, as I have said, in the case of the DGRC, in relation to the research councils and in relation to Technology Foresight and others. Alistair Macdonald, who now looks after science and technology in the Department of Trade and Industry

[Lord Trefgarne *contd.*]

is a member of the Technology Foresight steering group—a good member. We are working hard to get complementarity between what we are doing in the Office of Science and Technology and what the Department of Trade and Industry is doing in the specific industrial areas.

Chairman] That I think probably brings us to the end of this particular session, Professor Stewart. Thank you very much for the great help that you have given us. It has assisted us in our deliberations greatly. Thank you very much.

Examination of witness

PROFESSOR SIR GEOFFREY ALLEN, Kt, FRS, FEng, FRSC, FInstP, called in and examined.

Chairman

674. Sir Geoffrey, we are most grateful to you for coming to see us today. I know that you have been present to hear Professor Stewart's evidence to us. We should particularly value your thoughts about the Technology Foresight exercise, in which I know that you have an interest, and I wonder whether perhaps it would be helpful to the Committee if you told us about your interest in it and then perhaps we could go on and talk about the technology exercise as we have just heard it described.

(*Professor Sir Geoffrey Allen*) My Lord Chairman, thank you. First of all I must thank you for the opportunity—an unexpected opportunity—to come and give evidence. My involvement in Technology Foresight actually predates the work of the Office of Science and Technology. In the new materials institute we have brought together the Rubber and Plastics Institute, the Institute of Metals and the Institute of Ceramics and since then various smaller societies and bodies have agreed to join this amalgamation. We had various open discussions about what we should do. In 1992 it was agreed that one thing that we could try to do was to provide a strategic view of materials in the UK economy. We took advantage of what was happening in Japan and what was happening in Germany on this front where we felt that the various groups had got together extremely well to lay out first of all the scientific opportunities and then the technical needs of their different industries, and we hoped that we could do that. About a year later when we had solved the organisational problems, to a degree of bringing the three institutes together we were ready to start, and at that time we were close to having the White Paper. So we decided to wait to see what the White Paper would do and only put down at that time the barest framework of what we were going to do. We were quite clear, my Lord Chairman, that if we did a very careful survey of science, because science is international we should come up with very much the same views as the Americans, the Germans and the Japanese. So we decided that we should not start from that end but we should attempt something that would impinge directly on the welfare of the UK economy. Before the White Paper came out we had already agreed on a steering committee to oversee this work. That steering committee had three components, first of all, three senior people from the industries that purvey materials, three senior people from the user industries and then we needed of course some scientists and technologists. In the event we have the CEO of the Higher Education Funding Council in England because he happens to be a materials scientist. Then we have a representative from the universities chosen by the Science and Engineering Research Council, and that was our package. We then looked around and saw that all the industrialists came from relatively large companies and we wanted someone who was particularly interested in the welfare of small companies. Therefore, we invited on to the steering committee a lady from the CBI who had a particular interest in technology in small companies. We also invited the person at that time in charge of setting up the Foresight activity in the Office of Science and Technology because we did not want to have a great gap between what they were doing and what we were doing. That turned out to be a stroke of luck because within a few weeks he was transferred to the Department of Trade and Industry and subsequently has given us the best link that we have ever had into the Department of Trade and Industry. The information that we have had from there has been very good. Now we, of course, are only dealing with one of the 15 sectors that the Office of Science and Technology is dealing with. Nevertheless even to deal with one sector we felt that we could not just let the thing run and that we would have to manage the operation in some sensible way. We feel that to try to run all of our sectors at once is too big a management exercise and that we need to get our feet wet on three or four. We have chosen about nine sectors. We have started three, and we are about to start the fourth. The method is that the steering committee chooses a chairman for each working party. The chairman, in consultation with us, is allowed to choose the working party. We like him to have at least 50 per cent and preferably a majority of industrialists because they have much of the information that we need in their companies and we do not want to have to go and create that for ourselves. We have now started work. We are well advanced in the aerospace sector, materials for aerospace. We have a first crude report on energy transmission and energy generation. We are now trying to get going on ground transport, which is proving quite tricky because of the many facets. Two people, the CBI person and the person representing the Higher Education Funding Council, representing the universities, were very anxious to do biomedical materials, so anxious, my Lord Chairman, that they have taken the lead on that and we have left them to it. These working parties therefore are now under way. We have found that one of the things key to getting a working party off the ground quickly is to get a consultant who is respected in that area to do a short paper. We find that they can do it very quickly

[Chairman *contd.*]

because they are advising most of the companies involved anyway and are often advising Government. That really is a very quick and relatively inexpensive way to start up and then the working party comes in and digs around this, decides whether it is complete or not. We have also provided another prop for each working party in that there are the reports from NISTEP in Japan, from the Germans and from the Americans on technology, so we have asked two university groups to take these and to give us a report on the science opportunities and the perceived major technical thrusts from these reports. This prop will be given to each working party so that they can draw it together with the industrial perspectives of what the needs will be and some of the government perspectives of where there are needs for new materials. We hope at the end of about a year in each sector to have a report. We have also thought what we will do with the report. We are going to have a town meeting to bring together industrialists, academics and government scientists and technologists, and we are going to have regional meetings. They will be determined on the local government activities or the local university strengths, we want to generate local interest groups as well as national interest groups to move the thing forward.

Baroness Platt of Writtle

675. May I just ask, my Lord Chairman—I am sorry I had to leave for a moment—who "we" is?

A. The Institute of Materials. We are now in the process of writing three reports and we are in the process of thinking out how to bring the people together, but we have thought about what will happen after we have had discussions. We think that four things may come out of these reports as a result of the discussions with the community. We found it very difficult to try to get all the community on board at the beginning. We decided that we should do it the other way, offer them something and see how they reacted to it. We think that four things will come out, my Lord Chairman. First of all, there will be company to company activities and we hope to act as catalyst to bring companies together to pick out particular themes or particular opportunities and we expect that they will do it for themselves after that. The second thing that we want to do is to look for activities that are relevant to small companies. Here we look very much to Mr Keddie in the Department of Trade and Industry because he has an excellent programme going on help for small companies who want to do innovative things. We feel that we will have one or two projects of that character and we can work with the Department of Trade and Industry to find the right companies. We also feel that with the small companies we may need the help of our steering committee to find bigger companies to act as early customers and to help to specify the nature of the materials that they want. We should expect BT, for example, to be a company of that kind. Then we imagine that there are going to be quite a lot of initiatives that could be taken at the interface between the science base and industry and we should turn to LINK and to teaching company schemes and try to promote them that way. It is hoped we could use LINK outside the Engineering and Physical Sciences Research Council and we hope to use teaching company and so on inside. Finally, my Lord Chairman, there will be some initiatives where the United Kingdom has to start from scratch or where it has to develop new research teams. There we could turn immediately to the Engineering and Physical Sciences Research Council. We think that in terms of initiatives that might come out of this in terms of new materials we can cover every eventuality without new mechanisms. All that we will do is act as the catalyst. There is, however, one other thing, and this is the reason that we are so pleased to have the Higher Education Funding Council representative on board. We believe that there will be opportunities for training. We think that the study will emphasise the importance of materials in engineering faculties. In Britain it is something where we are rather weak, my Lord Chairman. Materials studies tend to be tucked away in the materials department. In Japan, in Germany and in the United States knowledge of materials underpins almost all the engineering activities. We seek—privately hope—that out of this there will come this benefit for engineering teaching in the United Kingdom. That is where we are at the moment, my Lord Chairman.

Chairman] Thank you very much, Sir Geoffrey. I do not know whether Lord Porter would like to come in here. You asked Professor Stewart about the process.

Lord Porter of Luddenham

676. Yes, that is right, my Lord Chairman. May I just first of all though ask this, following immediately from what Professor Allen has said. It does seem to me to overlap the Technology Foresight. They do in fact have a group on materials, do they not?

A. Yes.

677. Do you see this as augmenting it or is it a duplication or what?

A. I think that ours will be a more pragmatic approach than the approach that is being attempted within the Office of Science and Technology. I think that they will have bigger overlaps with other areas which we will only get by going through the engineering institutions—not an easy process.

678. But it will be very important to work closely together, will it not?

A. May I now address your question explicitly. What we did, of course, was to bring Robert Foster in immediately into the steering committee when he was the man setting up Technology Foresight and we did not really know whether it was going to be subject oriented or business area oriented. Therefore, he has been in from the beginning and he has been very helpful. There was then a hiatus while all the consultation was going on. We all went to the consultations. It has been very helpful to us to listen to that. We have been able to get on quicker because of it. We have benefited by the enormous enthusiasm that the Office of Science and Technology have generated in Technology Foresight. I should say if they have had one success so far it is that everybody is talking about it and a lot of people are prepared to do it, to take part in it. But now we do know that

[Lord Porter of Luddenham *contd.*]

John Campbell of Cookson is going to be the chairman of the materials committee. He already knows what we are doing. We are meeting him for lunch on Monday. On Monday I shall still be the senior vice-president of the Institute of Materials so the president and I will meet him and with Ashley Cotterill, who is fortunately our Secretary and used to be secretary of the SERC, so I think that we are fairly well integrated.

679. In some ways, of course, it can be argued that the best people, the people best qualified to do a Technology Foresight exercise, are the professionals in the institutions in that particular area?
A. Yes.

680. And that all that the Office of Science and Technology needs to do is to ask their advice or at least put them together, is that not so?
A. Well, my Lord Chairman, I think that there is room for both. The institutions are highly structured bodies and the interfaces are guarded rather jealously, as Baroness Platt can tell you—I can show you the bruises! For instance, in terms of ground transport we found it very difficult to get a coherent group inside the Institute of Materials. We have now done two things. First of all, we have asked the retiring president to take it on as a special issue for us. Secondly, we are going to the mechanicals and the electricals and so on to get a composite group going.

681. Finally, just to follow the Chairman's suggestion, may I ask you that question about whether in all this business what really matters is the process—I am sure that is important—of bringing together everyone or do you actually see formal recommendations being implemented as a result of your exercise?
A. I will have failed, my Lord Chairman, if suppliers and users do not get together and we do not see one or two projects of that kind. I will have failed if there are not some new initiatives for small companies. I am not going to say that new companies will be set up, but I should have hoped to see two or three changing direction within the next three years, not five and ten years on.

Lord Dainton

682. My Lord Chairman, I should like to ask Sir Geoffrey just one question. It seems to me that Technology Foresight has to be an on-going process?
A. Yes.

683. Because the world does change and it does seem to me from what Sir Geoffrey said—and I should like to have his views on it—are we interpreting him correctly as saying that there is a place for both Government doing its operations and the community itself doing their operation linked wherever they want to be linked but they will naturally have some different perspectives?
A. Yes, it is not a flat world, it is a three-dimensional world and you need at least two kinds of groups operating.

684. Now there is a third element in this, and that is the able people who will carry these things forward in the future. How do you engage the enthusiasm of the working scientists, technologists, whose present preoccupations are perhaps in the fundamental end?
A. The importance to me of our regional meetings is just that. At the meetings in London of people coming to talk this over we will have all the senior people, but in the regions we can get at the young people in industry and the young people in the universities and we will specifically ask for that. Fortunately, my Lord Chairman, several of us are in a fairly good position to know whether they are coming.

Baroness Platt of Writtle

685. My Lord Chairman, I was very interested in what the Institute of Materials is doing—it is after all quite a small institute. I wonder whether you are aware that other groups of people are doing a similar thing. As you say, materials are cross-faculty, which is very important, but then you have got the matrix, as it were, in this 3D thing of the different panels of the Office of Science and Technology and I wonder whether other people are perhaps paralleling areas of their working parties to underpin this community aspect from a knowledgeable point of view?
A. Yes, that is fairly easy to find out as a matter of fact. There is quite a good network of secretaries of institutions and, of course, all the arguments over whether there should be an engineering council make it very easy for us to meet them every month, so the bush telegraph works rather well. But of course there is another dimension and that is with the science and technology institutes. The Institute of Physics, the Royal Chemical Society and so on are very important to us in this operation.

686. But are they doing it in different areas?
A. No.

687. You are the only one?
A. In the science and technology societies no one is doing this, but at the moment I am the retiring chairman of CSTI so they know what we are doing and, indeed, they know that I am here today talking about Technology Foresight and DRA have been briefed by them.

688. Then it would be good if they were doing it too in different areas perhaps?
A. I think that I should like to see the engineering and science and technology institutes having one kind of operation and then I should like to see the kind of operations that the Office of Science and Technology is doing going on perhaps rather more ethereally directed than ours, but there is room for both, I am sure.

Lord Porter of Luddenham

689. Of course, it has been done for chemistry in America, has it not?
A. Yes, it has.

690. Very, very thoroughly?
A. Exactly.

691. And that is one reason that the Royal Society of Chemistry did not do it, I think.
A. Yes.

[Lord Porter of Luddenham *contd.*]

692. But Sir Geoffrey would say probably that what should be done in this country should be more relevant to UK Ltd and the American one is not and the Japanese ones—they have done it—are not so relevant to us, is that so?

A. If you look around the world, the American document ought to be read by most British chemists, I should say, and that is true of the Japanese, but at the end of the day you have to ask two questions. What are perceived to be the leading thrusts in science irrespective of how you are going to use science perhaps is the most important question that the science base should ask. Then you should ask, which of these and what other things that are not major thrusts are important to the United Kingdom. The second question is very important in the Technology Foresight exercise because it picks up several things that will not be highlighted as the leading developments globally. That is what we have asked our university group to do, that is the question we have posed.

Chairman

693. May I now relate those criteria specifically to defence industries, not necessarily to the Defence Research Agency. Do you feel that there is a particular relevance for the Foresight exercise in the defence sector? It occurs to me that of the four categories that you mentioned quite a number of these could be said to be highly appropriate to the defence sector. Is there anything that you feel that the Office of Science and Technology or, indeed, other departments should be doing to build on to this Foresight exercise in so far as the defence industries are concerned?

A. First of all, my Lord Chairman, the defence industries have been quite good at doing Foresight exercises. They are however highly polarised, as you would expect. There are major issues that have to be addressed and solutions found. I have been involved in these as an outsider, never on the inside. Over the years I should think that I have been to three or four weekends which have been giving us the results of the Technology Foresight exercise and asking for a broader view of it, so they do it quite well. I think that the problem now with the Defence Research Agency frankly is that it has got a dual role at both interfaces. On the interface with its department we have already talked about having a dual role. I think that the Defence Research Agency will be a marvellous partner in the OST exercise, but for certain security-led activities it must do that inside, so it is going to be involved in two different kinds of Foresight exercises. The important thing, of course, is that it can transfer information from the civil exercise into the defence exercise. It will need to do both kinds. Then the problem for the Defence Research Agency on the other side is one that Lord Dainton touched on. It is offering itself as a research outfit which industry can invest in. At the same time it is doing research for the Ministry of Defence and advising them on the quality of other people's operations. I think that industry is going to find that rather difficult to understand.

694. Does that specifically inhibit their contribution to the Technology Foresight exercise, do you think?

A. No, I do not think that it does, my Lord Chairman, because of course that is not at the stage where industry has to decide whether to hire them to do some research or allow them in to inspect what they have got to offer to the Ministry of Defence. No, I do not think that it will get in the way of Technology Foresight, but it will get in the way, I fear, of industry reacting at the interface with the Defence Research Agency.

695. Certainly that is an area on which we have had much opinion.

A. The other area I think is not insignificant. You see, on the one hand it is an integral part of the Ministry of Defence. In its other activities it is behaving like a quango, so it is one stage removed, and it is a very difficult position to maintain.

696. There is one last matter that I want to put to you which is completely unrelated to Technology Foresight. We wanted to ask you whether you were familiar with Total Quality Management schemes in research establishments and to what extent you felt that they might be appropriate?

A. My Lord Chairman, this is a very long story. If you have been involved in research in industry—well, in any activity in industry—there are from time to time fashions which last about five years. I remember in 1975 when I spent half of my time in ICI and I was sent off on a Blake's grid management training exercise and one was told all about participative management and so on. You were then sent back to practise it in your factory or in your research lab. Over the years we have had a variety of these. The latest and the one that is just going out of fashion, I should say, is Total Quality Management. The idea behind it is marvellous. The idea is that the people directing the company, the people working in research who are providing processors and products for the people in the factories to make who then send them on to the customer, for them Total Quality Management is about improving the quality of the interactions throughout the whole chain. I think that it will be relatively easy for the Defence Research Agency to have a Total Quality Management chain within the defence sector, that is, management, but as yet, of course, it has not really got customers in the private sector and they are going to be of various hues. They are going to find it quite difficult to do Total Quality Management with such a diverse set of clients. In Unilever I had six business areas as clients and that was a lot to handle, I have to say, and some of them did not want Total Quality Management and some did. It only works if everyone in the chain is involved. The customer has to get involved as well and has to help you improve your abilities, the quality of your work. It is managing the quality of the work that you do, not just quality management.

697. It implies that you have to have quality management throughout the Ministry of Defence, does it not?

A. Yes, indeed. Well, that would not be a bad thing, I suppose—as a taxpayer I must support that idea! It has really proved too big for many companies, it takes up so much time. You see people spending 20, 30 per cent of the time just on setting up these interactions, having the group discussions and

[Chairman *contd.*]

so on, and then of course having set it up maintaining the quality of interaction is not an insignificant activity. Many people therefore reckon that it is a thief of time and impossible to sustain for long. On the other hand I have no doubt that in Unilever it gave some very good impulses to better ways of working between business and research, between the board of executives and the business.

Baroness Platt of Writtle

698. And it should also be in aid of better quality for the customer surely?

A. That is where you start. You meet with the customer and say, how can I give you a better service, how can I improve the product or the process or the service. It begins there, and this is where the difficulty arises for the Defence Research Agency in their present circumstances: the only sure customer that they have at the moment is the Ministry of Defence.

Lord Trefgarne

699. I have been exposed to some of this in the past and, of course, in the distant past the Ministry of Defence had a system of quality assurance of its own?

A. Yes, that is different.

700. Contractors were required to adhere to the quality standards. More recently there has been a move to allow firms to qualify for MoD business by adhering to BS5750 and it should therefore be a fairly straightforward thing, one would have thought, for the Defence Research Agency to adhere to BS5750 in those areas where it is relevant and applicable. You seem to be saying that that may not be so?

A. No, I see BS5750 as something rather different. In BS5750 you write out all the things you do, your practices and so on. These are vetted and if they meet certain standards than you are awarded BS5750. The customer then knows what he can expect from you and one hopes that it will reduce the need for quality assurance, that will just disappear if all is right. Generally, of course, people are not so trusting as that and it reduces the level of quality assurance but does not remove it. It is a rather different thing from Total Quality Management. One is very much about process, the other is about the interaction between the people and the process that results from that.

701. The ultimate objective is the same, to get the product in the best possible form?

A. Yes, but there is a difference. With BS5750 if you are going in the wrong direction it will not correct you. What it will do is make you go in the wrong direction more effectively. With Total Quality Management it should be self-correcting all along the line. That is the difference. This is where the people interaction is so much stronger—well, that is the idea.

Lord Craig of Radley

702. But if Total Quality Management, as you say, is going out of fashion what will be coming into fashion or is coming into fashion?

A. Oh, there will be other forms and soon one of them will get a label and it will be sold by the management consultants around the world. I think that it is necessary unfortunately to have a kick in the pants now and again by being told to think about what you are doing. I can give you an example that I understand much better than Total Quality Management because I am not very good with people, and that is computer integrated manufacture. About six, seven years ago this was the "in" thing. All our factories were going to be run by computer integrated systems and people just went round and made sure that everything was working and picked up any bits that flew out. Of course, the great thing about computer integrated manufacture was that you could only start writing the programmes when you had a flow sheet that you had actually written for yourself which showed you exactly what you were doing, and that was a very humbling experience. What went on in your factory often bore no relation to what you thought went on. The value to me of computer integrated manufacture was that, that you looked at your factory, you had an opportunity to put a few things right although it turned out to be a difficult thing to write the programmes for the computers. People are still doing it, but it is nothing like as popular as it was five, six years ago, but the factories are becoming more efficient.

703. A form of internal discipline?

A. Yes, and again, you see, what happened was you looked at your factory and suddenly you realised that your raw materials supplier was the real problem or getting the products distributed to your customers at the right time and in the right quantities was a problem—the factory was often quite okay. On that note, my Lord Chairman, may I just say that I hope that whatever happens to the Defence Research Agency they do retain their expertise in systems management and systems engineering. They are quite the best in the country, and systems engineering is an area where the United Kingdom is not in the lead and they are one of our greatest assets. That is one particular thing that I should not like to see go, my Lord Chairman.

Lord Renwick

704. My Lord Chairman, I know that Sir Geoffrey has had a copy of the evidence from members of the CSTI and on that basis there is one rather worrying comment about the moving of managerial staff every two or three years. Would Sir Geoffrey like to make some comment about that perhaps, the fact that they lose their expertise? Is that true throughout the whole of the Civil Service, and is it new?

A. I have to say, my Lord Chairman, that one of the great problems in directing a large research organisation is getting the time scale for the turnover of people right. You can leave some people in the job for the whole of their life and they come out at the end still terribly enthusiastic, but in management one does have to keep moving people around. You need the expertise that they have gained in one job in order to do the next job better, but two to three years is too short. I hope within the Defence Research Agency they would have an effective system of leaving the experts more or less in place and having managers who move on a time scale of five or six years, not two or three years.

[Lord Renwick *contd.*]

705. There was evidence from the Institute of Physics who said, on the question of costs, that such an approach could seriously jeopardise the provision of advice to the Ministry of Defence.

A. Yes, my Lord Chairman, I think that it would because one does need to have a certain knowledge base before one can give sound advice. Rarely are you asked for advice now on a very narrow topic. There are many interwoven things that come into the balance of the advice that you give, and this does mean that you have got to stay long enough in a post (a) to make some mistakes and (b) to put them right before you move on and then to have learnt the interacting features.

Baroness Platt of Writtle

706. And then on page 3 there is a paragraph on relations with universities in respect of the movement of staff, who, as you said earlier, are the key, between industry and academic life which has always been one of the great difficulties, although I think that everybody recognises it as an ideal?

A. I do not understand this because the United Kingdom actually does it rather well.

707. You think so?

A. When I go to Japan they are much more rigid than we are. We do it rather well, yes.

708. It is always said that Germany is rather good at it but we are not.

A. Ah, in a different way. If you look at the training of technical people and so on, they have had a much broader experience before they actually become managers. That is where they have better flexibility. Of course, some very senior people will spend half a day or a day a month going to a university and being part of that university, but now we have quite a head of steam on that and certainly our CASE awards really are greatly admired around the world, not just because of what happens to the student but for the fact that an industrial scientist and an academic scientist join in a project and there is an outcome. They deal with the stresses and strains of looking after that student.

Chairman

709. I wonder as a last question I may just refer to something that I mentioned to Professor Stewart, and that is the opening of the new structural materials centre at Farnborough, which is a collaboration between the Defence Research Agency, industry and academia. Is this something in which your institute has been involved or has a view on as to whether it is likely to be successful?

A. We have not been involved in it, my Lord Chairman, and we do have a view on it, that it will of course deal with the upper quartile of materials. These will be relatively expensive, highly engineered materials and the United Kingdom must have a centre like that. We should fully support that centre. But, of course, it is not where the bulk of the work on materials is done and the demand on those materials is relatively small. The concern is who will pay for that kind of research. I think that only two or three companies in the United Kingdom really will want that level of technology.

710. Obviously those will be the larger companies so it is irrelevant to small businesses?

A. Not irrelevant, my Lord Chairman, but they would hope to get it through some government programme. They just would not be able to pay for it. This is one of the worries, you see. I am sure that Mr Chisholm is aware of all this. He is a very good chap and I am sure that he will find some modus operandi, but there could be a lot of bruises on the way.

Chairman] Sir Geoffrey, I think that we have asked the questions that we set out to ask and a few more, no doubt. Thank you very much for your help, we are most grateful to you.

THURSDAY 12 MAY 1994

Present:

Craig of Radley, L.	Selborne, E. (Chairman)
Hilton of Eggardon, B.	
Howie of Troon, L.	Dainton, L.
Platt of Writtle, B.	Dundonald, E.
Renwick, L.	

Examination of witness

Mr J Chisholm, Chief Executive, Defence Research Agency, called in and examined.

Chairman

711. Good morning, Mr Chisholm, thank you very much for joining the Committee today. Could I remind you that it is some months now since you gave us a preliminary talk in this room and we are, I think, rather better informed now than we were then about the scope of the work of the DRA. Could I say that in the intervening period we have been given the most helpful advice on all occasions by your colleagues and we very much appreciate the help we were given both in the research establishments and in this Committee by your colleagues. Thank you very much for all that help.

(*Mr Chisholm*) Thank you.

712. What I would like to do is to start by asking a question about the Framework Document and that is in fact the first of the questions that we hinted we might wish to ask you. I must say it is unlikely that we will go through the list of questions thereafter in straight batting order and I am sure we will wish to range rather widely. Please, at the end, if you feel that we have not covered some of the areas which you feel might helpfully be discussed we would, of course, be only too pleased to come back on such subjects. If I could perhaps start by asking you to comment at the moment on the Framework Document, the latest of which is I think dated April 1993.

A. Indeed, my Lord.

713. Do you have any plans to suggest this might be altered in any way?

A. I think, my Lord Chairman, the answer is strictly no this time. The DRA is a trading fund. The primary control in terms of operations is through our customers as opposed to through the Framework Document. This theme will appear several times, I think, through this morning. Although the Framework Document provides limits as to what we can do, the principal limit to what we can do is provided by what our customers give us money to do.

714. Nevertheless, the Framework Document in some ways could be interpreted quite rigorously. It is clear, for example, I do not think it would be something that you would wish to change, that there is strict ministerial responsibility to the Secretary of State for Defence. That seems appropriate, does it not? We wondered whether the Framework Document could usefully give indications as to how appropriate links with, for example, the DTI or the OST might be developed. Do you feel that there is any scope within the Framework Agreement to enter such arrangements?

A. I do not see that the Framework Document itself would be necessarily the exactly appropriate way of registering those. We are developing our links with the OST and with the DTI in particular. The DTI do provide funds to us of quite substantial order at this time—£26 million in the last year—and that enables us to achieve in many ways leverage off the MoD funding to provide the benefits of our MoD research to the wider community. We do have links, and I hope are continuing to develop links, with other Government departments. Although it may be sensible at the next revision to reflect some of that in the Framework Document explicitly I think in reality it would not either prevent or expedite the current chain of events.

715. Of course, a number of documents that we have seen, not least the Forward Look document published recently, stress correctly the initiatives that the DRA and MoD have taken to improve the integration of civil and defence research.

A. Yes.

716. But is there in any sense an inhibition at the moment because the Ministry of Defence has voted by Parliament funds for defence of the realm which might ultimately act as some handicap in attracting your core funding to areas which perhaps could not strictly be interpreted as defence of the realm, we may be talking about mathematical modelling or some other subject which may or may not have an application to defence matters? Do you feel that this is an inhibition at the moment?

A. In a sense it is, and properly so, in the sense that defence money is voted by Parliament for defence purposes. Our customers have that money and pay us to do work in order to further the purposes for which they have that money. Therefore, there is a chain of cause and effect which ends up with us having a contract which says: "Do this piece of research to achieve these ends". We interpret our role, through the Framework Document and through other policy initiatives, as undertaking that work and then trying to achieve from that the maximum additional benefits. Perhaps if I could just spend a moment explaining that. The reason we do that is because I perceive that the most important thing I have got to achieve for the survival of the DRA is that the DRA should be seen to be valuable, both to its customers and to the community at large. Therefore, it is in our interests to achieve the maximum value from the research funds that we get, that value not only specifically in relation to the defence monies and therefore the defence objectives of those monies, but

[Chairman *contd.*]

also value in relation to what other benefits we can draw from those funds. So we see it as a supplier as opposed to a customer, as a supplier's interest to gain the maximum value from the work that we do.

Lord Dainton

717. How tightly drawn is your contract with your prime customer? I ask this question because, of course, there were occasions before when you have embarked upon research when by definition you could not often seen the outcome.

A. Yes.

718. What room for manoeuvre have you for seizing opportunities as you go along because you see they are perhaps of value to British industry rather than defence? What happens in DRA in those circumstances if your money is entirely allocated by the Ministry of Defence with such a narrow objective?

A. I think I should start by explaining it is not just one contract but we have hundreds of contracts according to which particular programme the money comes out of.

719. Does that mean they are more specific because there are so many of them?

A. Exactly so.

720. That gives you less rather than more flexibility?

A. Precisely. We have very specific objectives to achieve in each of the contracts that we get given. However, within that the choice of how that objective is achieved is down to us as the supplier, so we have a choice given a particular research objective as to how that is achieved. In doing that, in making those choices as to how that is going to be achieved, we try and take account of the wider implications of that research. To a large extent we have some freedom, particularly in the areas of generic technology, materials and those sorts of things. There is considerable scope for doing work in a way that is as much dual purpose as possible. Furthermore, we can then go along to other agencies, for instance the Department of Trade & Industry, and say: "Here is a proposal, that if you just provide—"

721. A little more.

A. "For every pound of extra money you give us you will get far more than that back because you will get the leverage of the research we are already doing, you will get the leverage to be able to take that research and particularise it to a zone which it was not originally intended for". For instance, in the materials world you could be researching a material, looking particularly at the temperature and strain regimes which are appropriate to the defence world and it is not very difficult, at the same time, to widen that to a regime which is more common in the civil world.

722. I can understand that. I think one of your programmes is non-metallic materials as a substitute for steel in armour, for example, and that has obvious applications. Clearly there are additional applications for non-metallic materials in the civilian world. It seems to me that the whole thing depends on how you detail it, the money is available to you in the contract. Have you broken down your objectives into a whole lot of smaller programmes? Are you given a global sum and can you vary how you use that money or is it line item budgeting when you get a contract because that is very rigid, is it not?

A. If I can just spend a moment or two to explain how the money comes down because I think that would be helpful. It depends upon which programme you are in. In our main programme 64 per cent of our business comes through the applied research programme. The applied research programme of some £400 million or so is split into 60 or so packages, so by arithmetic those packages are quite large. Within each package the contract that comes to us is in terms of the package and the objectives of that package. We ourselves split it into maybe 50 assignments. Those assignments within that package are quite specific research assignments but it is our choice about splitting that overall package into those assignments. Each of those assignments will typically last for three years and will have a particular research objective at the end of that, so you will be typically exploring a material, improving certain characteristics of it. The choice that that is a relevant piece of research to do in support of that particular package objective is essentially ours although, of course, we have to agree it with our customers.

723. I understand this. I had not realised your packages were so large, as it were, within the whole. What happens if you see something which presents an opportunity of a commercial kind which you believe in fundamentally and would like to spend more time doing but there is not a Government which will pick up the tab? Can you then take that out into industry?

A. The answer is that if it has a relevance to the interests of the Secretary of State for Defence we perceive then certainly we could—

724. Go back to him?

A. First of all we could go back to our normal funding agencies and make a case. Secondly, if for any reason they are temporarily embarrassed and short of funds we can go to other sources such as industry. Finally, we can see to what extent we could find some of our own funds.

725. So you do not need a kind of Rothschild research levy?

A. That is a separate subject, if you would like me to get into that.

Chairman

726. I would like to come back quite specifically to this point you made. You referred to the relevance to the Ministry of Defence. It may well be the research in question may not be relevant to the Ministry of Defence, however widely you try to interpret that, but could well be relevant to some of the priorities determined by the Office of Science & Technology, in other words something which is for the wider wealth creation or quality of life targets set by Government. In those circumstances do you feel that you would be inhibited from trying to attract alternative funding from the public sector, maybe even from the science vote, in order to maintain what might be an expertise within the DRA?

[Chairman *contd.*]

A. You probably do have a point there. Expanding it as widely as that we will eventually come to a limit where as our Framework Document is currently drawn we see ourselves as needing to do work which is fundamentally within the interests of the Secretary of State for Defence. The only counter I would put to that is the second item in our list of things for us to do work which is work on behalf of other Government departments. If other Government departments are going to pay us to do that then we will do it anyway.

727. The point about the Office of Science & Technology is they are not specific, they have an overriding responsibility to try and determine overall Government research policy, do they not?

A. Yes.

728. One of their preoccupations is to try and determine what falls between the cracks of departments and it is very possible that if it is not given the wide amount of expertise that you have within the DRA they might identify one of your research establishments as fulfilling precisely the niche that they have identified as needing to be exploited or filled?

A. Yes. If I could just recap. The logic of our position, I believe, is this: our primary role is to support the activities asked of us by the Secretary of State for Defence and that is what we do. Secondly, we do work on behalf of other Government departments when they pay us to do it, so anything they pay us to do is therefore legitimate within the Framework Agreement. Thirdly, we can go to other people, private industry, and propose to do work for them provided that work is within the remit of the Secretary of State for Defence, within the interests of the Secretary of State for Defence. So the limitation, if there is one, is that last piece of going to seek work from the private sector, it does not say at this time "within the interests of the OST or the DTI" or anyone else.

Lord Renwick

729. I think Mr Chisholm in fact has very nearly answered the question I was going to ask because in his clear description of the architecture under which he operates now I was going to ask him if he thought the interests of the defence of the realm were best served?

A. Within the current arrangement we have got I believe it is well served, absolutely. The Framework Document makes it clear that that is our job.

Lord Craig of Radley

730. I think that this leads us very well on to what I call DRA strategic relationships with the Ministry of Defence. We have seen details from the DRA's corporate Technical Strategy and that distinguishes between two possible models for future relations between MoD and DRA, namely the model of "commercial relationship, with DRA seen as consultant" and the model of "shared vision, with DRA seen as a strategic asset". What are the relative merits of these two models? How far are we towards moving towards one or the other? Do you have a view as to which is the correct model?

A. Yes, Lord Craig, I do. These two different views are issues which are very important for us to be clear about because they represent two poles and you cannot mix them. When I first took up my job there was a degree of confusion between those two roles and in many ways that confusion, I believe, had been the concern of my predecessor, Nigel Hughes, who I believe gave evidence to you on the difficulties of making progress in the early days. I wrote an early memorandum which asked for advice as to which way we were going to go and the result of that was a general acceptance that a shared vision type route was the one which the Department favoured. More recently that has been reinforced with a discussion held at the DRA Council which agreed in response to the paper that you have seen that that was indeed the current favoured strategy. So that is what we are operating on and that, I believe, is a perfectly satisfactory one and one which delivers considerable value to the Department and indeed to the nation as a whole. The other one would be feasible but you would need to do quite a lot of different things.

Lord Dainton

731. In the working of this shared vision which you have described so clearly, how is it, as it were, moderated by external advice? Does the Defence Scientific Advisory Committee help you in this? There must be points on which there are disagreements between the DRA and the Ministry of Defence, not disagreements, perhaps that is too strong a word, but where the emphases are different. Do you have any means of clearing those matters up? Is that the Defence Scientific Advisory Committee or is that purely technical?

A. That is a technical arena for advice. I should emphasise that we are not decision makers, we are advisors. We provide our advice to the defence staff and to others amongst our customers. Of course, they have other means of developing policies and it is up to them to mix those various sources of information and reach their own decisions. Our input is that of advice.

732. This sounds like semantics to me. This shared vision only works when you have got educated customers as well as educated performers, if you like. You are satisfied on that point, are you?

A. I believe that one of the strong features of the current arrangements is the very close understanding between the DRA laboratories and the defence staffs as to what the overall visions and objectives are.

Baroness Hilton of Eggardon

733. If I could pick up the metaphor that Lord Renwick used about architecture and the architectural shape of DRA, one of the things that concerns me, or puzzles me, is how the Ministry of Defence exercises what shape the building should be and the architecture of the DRA, what rooms should be contained in it and what expertise they should have. As I understand it they put contracts to other parts of the commercial world without consulting you on occasion and that I find extremely puzzling, as to how they decide which bits should go to you and

[Baroness Hilton of Eggardon *contd.*]

which bits should go elsewhere without an overall strategic view, sidestepping the shared vision?

A. Perhaps it would be as well if I explained our programmes because in terms of our core activities, which are the activities that we do on behalf of the Ministry of Defence in the strategic research programme and the applied research programme, in both of those all our customers come directly to us and it is up to us, it is our job, to involve other people and other people's input into what we do so we are essentially the prime contractor for that advice on behalf of the Ministry of Defence. Obviously there are quite clearly other people the Ministry of Defence go to as part of the other programmes but in terms of those two central programmes, the applied research programme and the strategic research programme, we are the prime source of those and we integrate that on behalf of others. Since those are the largest single research programmes I think the shared vision works well. We have to have a shared vision because we are doing that integrating on behalf of the Ministry of Defence.

734. That assumes somehow the Ministry of Defence has contact with the developing field of science and knowledge and so on somehow outwith, if I may use a Scottish expression, that it is provided by you and in some way they have some sort of source which advises them on what the overall picture is which does not come from you if something is going away or coming from elsewhere. I am not sure in changing circumstances or if the environment changes how they are going to decide fresh expertise or whatever should come from you or should come from elsewhere. I do not see how the Ministry of Defence is actually getting the scientific advice that it needs from elsewhere.

A. The Ministry of Defence has its own scientific staff.

735. That is what I find so puzzling.

A. It has many other routes into the scientific community.

736. Should that not all be in some way mediated by the Defence Research Agency?

A. Well, in a sense you go beyond my own role as Chief Executive of the Defence Research Agency if you ask me about how my principal customers should organise their affairs. What I am describing here is how to make the best use, best value, out of the asset which I control which is the Defence Research Agency. Our view is that one way of making the best use of that is having that shared vision and a close understanding with our customer so that we can act as our customer's prime source of advice.

Lord Howie of Troon

737. Could I ask what proportion of the MoD budget goes to the DRA?

A. It depends on which budget you refer to. If you refer to the £23 billion, we get £600 million out of the £23 billion.

Lord Renwick

738. But of the other scientific resources to which Lady Hilton was referring?

A. Again, it depends upon which budget you refer to. There is the equipment budget which is about £8 billion or so and there is the R&D budget which is £2.4 billion. When I say "budget", all I am referring to is the amount of money that is spent under those particular headings.

Lord Craig of Radley

739. This shared vision obviously could lead also into international research where there is both a political dimension and a technical or research dimension. I wonder if you could tell us something about your views on the way that has actually developed or should develop in the future?

A. Obviously we are not alone in researching the issues surrounding the needs of defence for the future. The other developed nations have very similar programmes to ourselves and it is part of our strategy to maximise the value of our research by minimising our re-inventing the wheel and getting the maximum benefit from collaborating with our allies. We do that through a very considerable programme of international collaboration with our allies, our allies both across the Atlantic, in Europe and in the Commonwealth. It is a very important part of our research programme and it is particularly important in relation to what we have just been talking about, the shared vision, because being a part of that shared vision allows us to collaborate on a Government to Government basis with other Government departments in those other countries. We believe that we get a very good return from that.

740. Is it a field which is expanding or have we reached as much collaboration as you think is feasible?

A. I think if you take the historical perspective we will find ourselves having to rely more on collaboration in the future, as the years go by, as all countries spend historically less on defence research than they have in the past.

Lord Howie of Troon

741. A very brief question. You said that the DRA was not a decision taker but was an advisor, does that not point away from the shared vision model towards a consultant model because after all one of the major things that consultants do is give advice?

A. Indeed they do. I do not think the terms were chosen to eliminate the thought that the possessor of that shared vision also gives advice. Consultants give advice. The terms were chosen to perhaps indicate on the one hand a very much arms' length relationship where the purchaser was essentially disconnected from the suppliers of that and was simply buying at arms' length, and on the other hand having a shared vision with the supplier so that the supplier of that advice understood intimately the needs of the purchaser in order to direct a programme of work that was putting that advice in the most appropriate direction.

Chairman

742. You were naturally reluctant when answering Lady Hilton to explain precisely how your owner and major customer should conduct their affairs, nevertheless I think it is important for us to explore the departmental arrangements for managing the DRA and for interfacing with you on this shared vision, after all if you are going to have a shared vision, which is clearly the preferred route, it is very important that the machinery should be effective. It would be helpful, therefore, if you could just identify to what extent it is working well or otherwise. We were a little concerned perhaps by the OPSS's report by Sylvie Trosa that you are familiar with, "Next Steps: Moving On", which of course is looking at all Next Steps Agencies and it is difficult to identify where she might be referring to DRA and where she might be referring to other Agencies. However, it would be fair, I think, to summarise the report as saying that she finds there is much room for improvement in the departmental management of Agencies. Would you like to comment on that report in the light of your experience as the Chief Executive of the DRA?

A. I do not think I would want to pick up any one of her particular criticisms because she is referring to the generality of Agencies. When I go to the events where the Agencies' Chief Executives get together and discuss common issues, although I can recognise echoes of many of the things that they say in my own circumstances, I would not want to say that in the particular instance of the DRA that I feel especially inhibited by some of the issues that she picks up in her report. The DRA is, comparatively speaking with respect to other Agencies, both very large and operating as it does under a trading fund has a very considerable degree of autonomy in relation to how it runs its own affairs. I think many of the points that she is referring to are satisfied by those two advantages that the DRA has got.

743. I would not wish to refer to personalities but the report refers to the Fraser Figure and the concept of "one link" within the Ministry of Defence to whom the Agencies, and the DRA in this case, should relate. Do you feel that the concept of one person identified within the DRA is the correct procedure? Do you find that it works effectively?

A. I think the important thing in the first instance is to distinguish between the relationship between the Department as a customer and as an owner and the Fraser Figure helps considerably with that by being clearly an owner relationship as opposed to a customer relationship. The clarification of that Fraser Figure within the Ministry of Defence certainly helped the DRA. I would only make an extra point from my own experience, that the owner role itself could be more helpfully separated in two halves which is the owner as a, if you like, shareholder, someone who possesses an asset and wishes to see it prosper, and the owner as a regulator. Those are two different aspects which sometimes could be better separated.

Lord Dainton

744. Could I just ask what I think is based on Mr Chisholm's own experience which is very extensive. Do you see the situation of being a contractor for your customer as a better and more workman-like relationship giving better value for money than the owner relationship? You have experienced both of course.

A. Can I just clarify your question and make sure I have understood it. When you say being a contractor are you reflecting back to the discussion we had before in terms of the two separate roles?

745. Yes. I am really saying there is a customer who is the Ministry of Defence and then there is yourself who is essentially the contractor, and now an independent one although with a primary responsibility to the Department for various things. That is one way of doing business. The other was when you were owned by the Ministry of Defence, the whole of the Defence Research laboratories of various kinds.

A. We still are owned by the Ministry of Defence.

746. Yes, in the legal sense but you have been stressing, and everybody has been stressing, including Government, the advantages of having this distance, of having the customer/contractor relationship as the basis of your relationship.

A. I believe that there are tremendous advantages in having a customer/supplier relationship. That supplies a degree of rigour and robustness in the relationship which is tremendously helpful because it means that our people know what they are doing and why they are doing it and they work tremendously hard on achieving the objectives they are set. I can tell you that if you actually go to Malvern and look at the records for February 27, which was a Sunday, you will find that 600 people booked in, about a third of the workforce. That is actually explainable by the next day being the 28th which was the end of the month and the milestones that they had to achieve were due in by the end of the month. That is a feature of the customer/supplier relationship with clear goals that people feel motivated to achieve, they are not forced to do, and they all put more effort into it as a consequence. I think those are good things.

Chairman] There are many university laboratories which you will find full on Sunday but they are not under that obligation.

Baroness Hilton of Eggardon

747. What happens if they do not achieve their milestone, they lose salaries? Is it performance-related pay?

A. They do not. People are self-motivated. If you set people goals they like to achieve them. It is essentially self-motivation. Clearly people who achieve their milestones more often over a long period of time will do better but they are not specifically financially rewarded on a particular milestone.

Chairman

748. Could we go back to the Strategic Research Fund. I think we did touch on the concept of the Rothschild levy earlier. Would you like to comment on the balance of funds for strategic research purposes and whether you find the balance is satisfactory?

A. Yes. It relates really to the point that we have been discussing today, the question of the shared

[Chairman *contd.*]

vision and the ownership by the Ministry of Defence. Because our purpose is to serve the Secretary of State for Defence our objectives in our strategic research, which is essentially our forward looking research in order to provide the oxygen for the future, so to speak, have to be aligned with our owner's objectives. It does not make sense because we are wholly owned by the Ministry of Defence for us to have separate objectives from those of the Ministry of Defence, and therefore it makes sense that our strategic programme is wholly aligned with the Ministry of Defence. The mechanism we have for doing that is that it is funded by the Ministry of Defence. Just to explain how it works: our laboratories are asked each year to put forward proposals for strategic research that they would like to do. So the scientists out there in the laboratories who are actually driving the technology forward, they are the experts, they come forward with proposals which they feel are necessary for their future. Through a complicated process of peer review, which we do not have time for, that is all judged, marked and then prioritised as to how it fits within our view of our objectives. Then we put it forward to the Ministry of Defence with some redundancy in that list for the Ministry of Defence to subsequently make its judgment on it. That way we are seeking to achieve a regime under which our laboratories have the freedom to put forward programmes which are necessary for their continuation of the excellence of their science and equally we have an alignment with our owner as to the overall direction of the organisation. That is why we have the strategic research programme the way it is and why we do not have a separate Rothschild levy. My concern about a Rothschild levy is there is a danger that our laboratories would start to go in their own separate directions different from that of the needs of our owner. That is the process we have got. I would have to say that it is one that we have been working on to improve. There have been difficulties with it. There was a danger that it was going to become in a sense too customer driven and just become another bit of customer funding and not sufficiently, if you like, science driven for this purpose really of providing the seed corn for the future. But we are addressing that. We also need to make it more in-year responsive than it is at the moment, it is a little bit remorseless the way it is at the moment. These are tweaks to the overall process which we are going through to make it better. Fundamentally, however, I believe the arrangement we have got with the strategic research programme funded by the customer is the best one and it is the one we are going forward with.

749. So if I get you right, Mr Chisholm, what you are saying is that there is a danger that your research establishment might become too customer driven, however the Rothschild levy would not be a mechanism for preventing that happening?

A. There are two dangers, one is too customer driven and the other is it goes off in a direction separate from that of the owners. What we are trying to do is to achieve both objectives: (a) get the innovation and fresh thinking in, which is what a Rothschild levy would do, but (b) tie it clearly to the objectives of the owner. That is what we are trying to do with the strategic research programme.

750. I suppose in part your problems would be resolved in this respect if a larger percentage of your funding from the Ministry of Defence came via the DCSA rather than from a myriad of customers?

A. I do not think this particular problem would be solved by that manoeuvring amongst the customers. I think it is true to say that when my budget, and when I first started this job I had a budget for the whole research programme through the usual vote funding mechanism, when that was split up amongst my customers it would have been amazing if we had got that absolutely right the first time round and there has been some fine tuning necessary on that as we have seen the programme develop and whether that programme as it has been developed is exactly what was originally intended. I would not want to be saying to you that there is no possibility of improvement the overall programme we have got at the moment but in relation to the Rothschild levy issue I am satisfied with where we are.

Lord Renwick

751. Could I just ask Mr Chisholm about the Strategic Research Review. If I understand it right the ideas come in in a technology push, as it were, into your Department?

A. Yes.

752. How does that tie in with the overall strategic requirements of the MoD or should we say the Secretary of State for Defence? Could you explain that in a simple way that I can understand.

A. When we kick off each year's annual bidding, if you like, for the strategic research programme we lay out some guidelines as to what objectives we are trying to research against in broad terms so that the overall direction that we are trying to achieve is clear, the major challenges that we see upcoming are clear. So the scientists, when they are thinking of what issues of technology they can address their attention to, go for the ones that are more likely to succeed. It is done through a process of using a briefing document for scientists and they then propose against that.

753. Does the shared vision mean that you at the DRA are aware of all the technology innovations that the MoD are aware of through their other activities that do not come through the DRA?

A. We believe we have a very good interaction with the MoD on exactly that issue, yes.

754. And of course they are using other commercial companies who might have an IPR problem on some of the technologies that are being presented to them. I know this is another subject.

A. We are talking here of a strategic vision, it is not at the level of individual IPRs at this moment. We are talking about a question as to whether naval warfare would be primarily in a deep sea or a littoral campaign. Issues of that sort are the things we are concerned with in setting the overall scene for the researchers to put forward their proposals.

755. So one technological invention or innovation might possibly change the whole balance?

[Lord Renwick *contd.*]

A. Yes, but that is unlikely to come at this stage in that sense from the strategic research programme. In the strategic research programme we may well be saying next year that we are probably going to allocate less funds to the electronic materials and more funds, say, to software innovations. That is the kind of guidance we will be giving. That guidance will have been drawn from conversations with colleagues in the Ministry of Defence who will certainly be informed by other inputs they have received. I have not, at that level, seen any evidence of IPR being a problem.

Baroness Platt of Writtle

756. Obviously your primary duty is to the MoD, that is in your Framework Document. You clearly laid out for us earlier the limitations that might have in that your assistance to other industry must be limited within defence interests. I read in the Framework Document, there is a part in 7(3), on co-operation with industry and it is pretty lightly laid out. The Government has now developed a thrust through OST and DTI, which is much stronger than it was, to support wealth creation in industry, would you welcome a much more overt role in advancing that activity and that there should be a duty, say, in the Framework Document?

A. I think that comes back to my point that we can only do things for which we are paid money because we are not given a pot of gold to go and spend as we please. The primary constraints upon what we can spend our money, our money we have to do our business on, are given to us not by the Framework Document but by the terms of the contract under which we get those funds. That is where the primary constraint comes from. The Framework Document only limits the sorts of contracts we can take and as we explored earlier on that limitation is wholly in the area of the level of contracts we can take from the private sector.

757. Yes, but supposing you had a duty to assist wealth-creating industry then you would not have the same limitation on contracts that you can take, would you?

A. As I said earlier on, we could perhaps relax the extent of any limits we might currently have on the extent to which we could take contracts from the private sector.

758. Would you welcome that?

A. I welcome anything which makes the DRA a more valuable entity.

759. Yes.

A. My principal goal is to make the DRA as valuable as possible.

760. It could have that parallel value in that obviously wealth-creating industry is vital to the future of our country. In America DARPA has been changed I think to become ARPA which does extend to all industry. Could one do that sort of thing in the United Kingdom or would you welcome it?

A. I think the point there is not so much the dropping of the "D" from DARPA but the fact that some 20 per cent of the funds coming to DARPA have been exclusively earmarked for dual use technologies. So, taking my point again, the primary control of what DARPA—now ARPA—does is not whatever document it operates under but by means of money it is given to spend.

761. But that could mean that the DTI put more money in for that particular aim?

A. You may be sure that we spend a fair bit of time explaining to the DTI the excellent things that we do on their behalf in assisting wealth creation.

762. Are they open to those suggestions in terms of the money being provided?

A. Like all Government departments they have to live within restricted means.

763. Of course.

A. I always find the DTI extremely helpful and supportive interlocutors.

Chairman

764. Would it come as a surprise to you to hear that we found on the whole the DTI were tending to focus rather more finely their priorities and far from widening the industrial base and using the defence research budget as a vehicle for contributing to economic security and economic expansion, the DTI are tending to look in finer focus all the time and this does seem to go quite contrary to the philosophy of the Americans where I think the Office of the Secretary of Defence has been given a much wider remit with a new office fully included within that Ministry, a completely different concept from that which the DTI has in this country?

A. I am glad you mentioned that because the point I was going to make was that all my experience in the applied research field, and I do emphasise the applied research field, is that in applied research to get a useful result you have got to have a goal. You are applying it for a purpose and you have to be quite clear what that purpose is. Applied research, in my experience, can easily be wasted if you are unsure of what you are trying to achieve with it. The Americans have developed a doctrine for economic security and under that doctrine they have developed a whole set of goals. Without that framework, simply to widen my remit and give me slightly vague targets, I do not think that would actually achieve the objective which you are looking for.

765. We are talking here now about a different framework, we were originally talking about your own and we are now talking of a wider remit for the Ministry of Defence or the DTI, or the inter-relation of the two ministries. Would you think that the Government have any lessons to learn from the Americans' quite dramatic change? After all, it was not something President Reagan supported. Do you think this is a concept that this Committee should be paying due attention to, further attention to?

A. I think, with respect, that rather goes beyond my particular terms of reference. I was merely making the point that in ARPA's case there is that framework, framework with a small "f", of economic security and that enables them to pursue that policy.

Lord Renwick

766. Could Mr Chisholm explain the doctrine of economic security? Could it apply to this country or should it?

A. It is I think fairly well described in Van Atta's paper[1] which I believe you have got.

Lord Dainton

767. I am a little bit worried about your remarks about no applied research can be effected without clear objectives. We would not have had polythene if that had been the case. There are many examples I can give. There is surely an area of work in which the actual nature of science itself is at a stage where there is not the capability within industry to take it forward and yet it becomes very important. There has been a feeling around for some time that part of the reason you were set up is one wants to get some of this work, if it exists, out into the applied field, even if it means creating new customers. How does one cope with that problem?

A. I think the point I was making related to the management of applied research programmes.

768. Yes.

A. For each applied research programme you need to have an objective. I accept your point that sometimes you have unexpected spin-offs and when you get an unexpected spin-off it is also an especially good idea to go and pursue it. When we were researching the materials for the EH101 helicopter, which had a problem, like most helicopters, of being under-powered and overweight, we were researching a lightweight new material and we discovered unexpectedly it made rather a good loudspeaker. Now that is not in our remit but we have gone out to find someone who will take that on. We do do things of that sort and we see it as being a useful thing that we can do. My point is that we would never even have got as far as we had got unless we had been quite clear that the purpose of our research was to produce a lightweight, stronger material to make that helicopter a viable project.

769. Can I just return to the fundamental question. Do you see in your experience the situation now makes it easier or less easy to do what you describe as taking something out into industry like, for example, the material to go into a loudspeaker?

A. I would make the point that in the first place such statistics as we are able to collect on this matter, we make faster progress in relation to our principal objectives so the rate at which we are doing things increases. We are developing mechanisms for ensuring that where we see unexpected spin-offs we can pick those up as well, but we cannot do that straightforwardly on the basis of Ministry of Defence funding if they go beyond the interests of the Secretary of State for Defence.

Baroness Platt of Writtle

770. That might be true, might it not? Is that not where if you have a wealth-creating duty you would be free from that first duty to a certain extent?

A. The money we get, if I can just go back to the specific example and try and draw some generalities out of it,—

771. A loudspeaker and a lightweight material is a very good example.

A. The money we get from the Ministry of Defence is to explore lightweight material, so that is what that team is doing. They discover by accident that it makes quite a good loudspeaker. It is then up to us to go and find some other source of money because it is not what is written in the framework document which is limiting our ability to do any activity, it is our ability to pay the salaries of the people who do that work. We have to go and find some other customer, typically for instance a loudspeaker manufacturer, and say: "Will you pay us to explore this material so that it may be of benefit to you from the research that we have done?"

Lord Craig of Radley

772. Is there any scope in the trading fund to exploit some profit you may have made on other contracts to develop that particular loudspeaker yourself, using that as the example, to a more commercially viable state?

A. The answer is yes there is but it is small. We have a small amount of money, small by the standards of the total size of the enterprise that is, which we make from things like licences or other commercial activities which we ring-fence in something we call the Enterprise Fund. In principle we can devote small sums of money to pursuing things like that provided we can see them as making sense to our overall mission.

Lord Renwick

773. Can I ask whether they take out patents themselves on developments such as this?

A. Yes, we do.

774. To what extent, within your terms of remit?

A. We have thousands of patents. We have a lot of patents. We have a Patents Department which actively pursues patents and as always with the patents business a few of them pay off quite handsomely and the great majority are sitting there waiting for the opportunity.

Lord Dainton

775. Do you have a marketing department too?

A. Like any professional services operation we have to market and we market at a number of different levels. Principally we market out of the laboratories themselves, the laboratories have the responsibility to sell their own activities. We have a small corporate marketing activity in which are things such as the Patents Office, the IPR Office.

Lord Howie of Troon

776. I am wondering, my Lord Chairman, about the helicopter and the loudspeaker. If you switch staff from the helicopter to the loudspeaker, does this mean that you run short of people at the helicopter end or do you take on more or does everybody come in on Sunday or what?

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[1] US Dual Use Technology: speech given to the Foundation for Science and Technology by Dr Richard A van Atta, 1994 (not published).

[Lord Howie of Troon *contd.*]

A. We are a large operation so we do have some ability to switch staff between one activity and another. The main aim of our research is the helicopter activity and therefore that has to achieve its objectives. The extent to which we put any effort into the loudspeaker, as I just said a moment ago, has to be limited by our ability to attract funds for it.

777. I realise that. I was talking about the people rather than the money.
A. It has to be extra effort.

778. Does this mean that you have always got a small element of spare capacity?
A. Like any service organisation one can always reallocate our resources so as to achieve in a short time span.

779. Is it a lot of spare capacity?
A. It is not people sitting around doing nothing, we have to stop some of the other things we are doing and move people on to it.

Lord Dainton

780. Can I ask one final point on research and then touch on another. In order to get some idea of the importance which you attach to this spin-off activity—a very bad term but we all know what you mean—is it one of your performance criteria by which you judge yourselves?
A. It is not at this time, no.

781. Can one be devised for that and would it help if you had it as a criterion in spinning off more into industry and assisting the objectives of the OST?
A. I would only be prepared to accept it in so far as I had the levers at my control to achieve the objective.

782. What levers do you lack at the present time?
A. In order to be able to do it I need some funds to do it with.

783. It brings us back to the beginning, where do those funds come from?
A. The funds that I have are those which are available to me, as I have just said, through what we call the Enterprise Fund and therefore the extent to which I can be successful is— Perhaps I am in danger of misleading you there. I can achieve the broader objectives in two ways. The first and most important way is as I was describing earlier, given an overall objective where I have what are called defence objectives where I have equal choices in that I can lean towards those that have a broader pay-off. That is what we do anyway. That is quite legitimate within the funds that we have available and even more so where those are incremented by particularly DTI funds. That is the most important area in which I can achieve those goals. To go beyond that I can only do so insofar as the money directly at my control, which is always going to be limited, is sufficient for that purpose.

784. May I ask could the money under your control be augmented by any revenue which you may have from the licensing of your patents?
A. Exactly, yes.

785. And you keep that money?
A. I do at the moment, yes, but it is always a matter of choice. It belongs to my owner at the end of the day, as to whether my owner wants me to use it for that purpose or give it back to him.

786. In other words the Treasury still has a clawback?
A. Ultimately, absolutely.

Chairman

787. The Treasury cannot help noticing, I think, that you have a source of money. Do you think the LINK scheme, which is due for revision, has any application in this area as an alternative source of funding in part from the Government but not through the Ministry of Defence?
A. LINK was essentially set up to provide a link between the science community and industry. The monies were provided by the science funding councils for the university side and the DTI would provide up to half on the industry side. There were going to be at least two industrial partners in each LINK programme. The fitting of the Government research establishments into that mould has not proved that easy. If the Government research establishments are going to do any work, given that they do not have any money of their own, who is going to pay for that? That has been a problem. Although the Ministry of Defence has paid through the DRA some £1.3 million under the LINK programme and there are maybe ten programmes or so that we have undertaken, it has not proved as easy a mechanism to date as maybe might first had been thought.

788. But Mr Waldegrave has said that he is going to look at the LINK scheme, he is going to revise. Do you have any proposals as to how he might revise this programme?
A. I certainly welcome his re-look at it and hopefully our contribution to his thinking there will be helpful. It does relate to this point I have made several times this morning, the principal limitation of what we can do is where it is legitimate for us to get money from.

Lord Renwick

789. We have had evidence, Mr Chisholm, about some possible conflicts of interest between you and your relations with industry. Have there been difficulties in assuring companies you have been working with of your ability to act impartially in your role as advisor to the MoD and competitor with or advisor to industry?
A. It is an issue which is there for industry. If I could just say a word or two about that. When I first arrived in this job it was a very high profile concern in industry because in those days, as I said earlier on, there was something of a dichotomy of policy as between the two models of what the DRA might be. I think the clarification of that and our clear intention to work again closely with industry helps a lot. I think, it is again proving to be difficult for perhaps three reasons. The first is very simply that I think industry does now recognise the DRA is a businesslike place and, therefore, possibly on occasions it is less comfortable to deal with than once it was. I think that has an effect. Secondly, I think that there is a mistaken impression within industry that somehow industry is getting less of the cake than

[Lord Renwick *contd.*]

once it was. I have recently drafted a paper which I would be happy to let you in evidence have a copy of, my Lord Chairman, a paper which does clarify exactly that issue and shows that if anything as a consequence of the policies we have been adopting industry has a larger share of the cake than it used to. The third relates to the subject of competition because both our owners, and indeed ourselves, are keen to assess the degree to which the DRA as a supplier is truly efficient and competition is an obvious way of doing that. The problem with that is that the DRA interacts with industry in many complicated ways. One of the principal ways it interacts with industry is as the front end of a value chain where ideas are first explored at DRA laboratories and are then placed out to industry by means of research contracts and eventually industry takes it up and produces value from it both in terms of defence equipment and in broader wealth creation. There is a passing across to industry which DRA laboratories have freely entered into over a period of time. If you actually put those DRA laboratories into some sense of competition there is a danger that that relationship will be broken. We are very concerned about that and we are trying to develop competition policies that achieve the two objectives, one benchmarking the DRA to make sure it is doing its job efficiently, and secondly ensuring that the positive relationship with industry does not get broken. It is difficult to achieve both but that is what we are trying to do.

Lord Howie of Troon

790. If, as you say, private industry is getting a bigger share of the cake does this mean that you are getting a smaller share of the cake?

A. Yes.

791. Is that a good thing or is the cake bigger?

A. No, the cake is smaller.

792. The cake is smaller and your share is smaller?

A. That is right.

793. So what is your objective of achieving maximum value?

A. We can achieve maximum value with a smaller cake. In fact, to date we have squared the circle by improving the cost-effectiveness of what we do so up to now we have produced more research for less money. There is a limit to that process.

Baroness Hilton of Eggardon

794. That is presumably by reducing the staff?

A. It is by reducing the support staff, yes.

Chairman

795. We have a recurring theme, it will not be a surprise to you, that parts of industry, by no means all, are concerned about the perception rather than probably the practice, the perception that the DRA is in competition with parts of industry while at the same time obviously acting as the Ministry of Defence's main advisor. I am clear that this is a problem which was bound to be there and I suspect was there in the early days when the DRA was set up. I suspect also that much of what you have told us has helped alleviate the problem. Nevertheless, would you agree that it is a fundamental problem, however effective Chinese Walls may be, to put across to industries that you can operate in two different modes, the first to advise the Ministry of Defence on research areas and, secondly then to get the confidence of industry when you could be seen in some respects to be in competition with them?

A. I fully accept the fact that there are those concerns out there. My answer to them is first of all that the area in which we are competing is additional work for industry, it is work that currently belongs, if you like, in the market that DRA operates so we are opening part of the DRA market to industry so industry cannot be the net loser from that competition. Secondly, we have to assure industry that our competition policy is not going to lead to less good decisions or advice being given by DRA laboratories. Those are the two things we have to achieve.

796. What weight do you think we should attach to those who have told us, this is by no means all I hasten to say, that they now feel inhibited in discussing research projects with the DRA whereas in the past they may not have been so inhibited with the previous research establishments?

A. Well, I would say that is a commercial decision for the companies themselves. If we do our job right, and I believe on the whole for the most part we are doing, the evidence I have is that for the most part it is working better than it is working badly, so to speak. The companies can only damage themselves by not being open with us.

Lord Dainton

797. There is of course collaboration with other countries and, for example, in the armoured fighting vehicle area and the electromagnetic tank gun and so on, does that type of collaboration impede your relations with British industry because they know the information is getting out through another route?

A. In any collaboration, and this is not only from our side but also from our collaborators' side—

798. You mean foreign collaborators?

A. Yes. In any international collaboration both sides are, in my experience, very concerned to ensure there is no passing across of commercial secrets as opposed to Government secrets.

799. It is very difficult, is it not, in some areas? Presumably the science gives it away.

A. Remember that the collaboration is deliberately Government to Government, this is why it is Government to Government. The collaboration we get involved in is deliberately Government to Government, from Government laboratory to Government laboratory, so we are sharing the information which we have developed in our laboratories with laboratories across the pond or elsewhere who have developed similar information to our science in their laboratories. It is sharing information which the two Governments are principal owners of.

800. I find it a very difficult area, perhaps you help me if I go back to the example that you quoted before

[Lord Dainton *contd.*]

which is the non-metallic material. If that is a case in point and some of the information was held in this country and some held with your collaborator there would be enormous market advantages to the one who had that information, who could carry it through more quickly. Is that an unrealistic situation? Have I described something which you would describe could not happen?

A. On the whole when collaboration takes place there are, as I said before, restrictions, very strong restrictions, to the extent to which that collaboration can be passed across on to the industrial side of the fence. It is to do with informing the two Governments so they can understand better and make the better decisions.

Baroness Platt of Writtle

801. You talked about a smaller cake and that that might produce fewer staff but also it might mean you are forced to close facilities. A number of witnesses have expressed quite considerable anxieties about the closure of those facilities. I wonder how you feel about that and what is going to happen?

A. In terms of facilities, I like to distinguish between historic facilities and future facilities. In relation to future facilities I do not think there is a problem because we will invest in future facilities to the extent that there is a good case for them, in other words there are going to be users for them who are going to want them. In relation to historic facilities that has not always been the case. We are an inheritor of facilities which were built in a different era. We were facing a different threat and we were doing different sorts of research. There are quite a few quite substantial facilities which we own today.

802. Such as ship tanks and wind tunnels?

A. Sure, but not all ship tanks and wind tunnels fall into this category, some do and some do not. Those sorts of facilities, large fixed facilities, which we would not build again today, on the whole the world is overpopulated with them. There are far more wind tunnels in the world than the world could ever actually use. In terms of those the reality is that we have them right now and the question is are they worth continuing to operate on the basis of the usage that we can now see or are they not worth continuing to operate on the basis of the usage that we can now see? We are trying to ensure that we establish a financial framework around them which properly articulates that issue without biasing it unfairly in one direct or another.

803. This does come back to wealth-creating facilities as far as industry in Britain is concerned because, okay, there may be too many worldwide but if Britain found itself without a particular facility and would therefore have to go abroad they would be in a less advantageous position than that of their competitors?

A. Not necessarily I would say. If there is a better facility abroad than we have here it could well be to our advantage to go to the one abroad than to use the one here.

804. Yes.

A. I have to say I am not convinced of this idea that bricks and mortar really make the difference in science, I believe it is more to do with your understanding, your ability to use the facilities than the ownership of the facility itself. We have in the wind tunnel sphere, as you know, invested in the European Transonic Wind Tunnel. We could not have afforded that ourselves.

805. No.

A. It could only be afforded on a European basis. I do not think we are notably disadvantaged in this country that it is in Germany and not at Farnborough.

806. If you have an investment in it of course you have a lien on it, do you not, and you were talking about too many facilities worldwide, well that might mean facilities that we do not own at all and have no connection with and then our industry would be less advantaged, surely?

A. Perhaps I can put it the other way around. Boeing is a major customer of ours, I do not think Boeing are disadvantaged by having us as their supplier.

Baroness Platt of Writtle] I cannot imagine Boeing being disadvantaged anyway but there we are.

Lord Dainton] What a pity one is inclined to think.

Chairman] I think this brings us on to links with industry. Could we talk about Pathfinder?

Lord Howie of Troon

807. I would like to ask three questions, but one at a time, about Pathfinder, strategic alignment and dual use. We were told, or it was hinted to us by Mr Hughes, that the DRA might be short of the capability to fund Pathfinder adequately. Is that a sound criticism or not?

A. Obviously Nigel Hughes is pretty well educated in the goings on of our business and his comments therefore I think have got more than a little truth behind them but if I just give you perhaps the facts of the matter. The first Pathfinder programme produced some 600 or so proposals, this is for Pathfinder 92, of which last year we decided some 43 worth £20 million were worth taking into the programme. In the event, because of the normal process that happens each year of budgetary planning, we have been able to proceed with approximately half of those. Therefore, to an extent Nigel is right in saying that perhaps half have been squeezed out through lack of headroom but that is not specifically related to Pathfinder *per se*, it is related to the fact that we generally have more good ideas for research that we want to do compared with the amount of monies that we have got available. I think it is well known that the amount of money available is reducing.

808. It is quite reasonable to suppose that you are unable to fund the whole range of these proposals that you have suggested, and I think you said you have managed to fund about half of them, the point here is do you think it is satisfactory that you fund half? You must, at the back of your mind, have some proportion, maybe three-quarters or whatever. Do you think, because of financial reasons that you are restricted to funding only half of these, that that is satisfactory?

[Lord Howie of Troon *contd.*]

A. I think that I am pleased that given that Pathfinder is something I perhaps launched without the more traditional lengthy process of consultation and planning, and therefore this was the first time out, what we have achieved is a very reasonable result. It was reasonable both to the extent that industry came up with, given the short notice they had, some excellent proposals and it was reasonable in the sense that we have been able to fund about half of those which we reckoned to be technically worthy of funding. I would definitely say I am not disappointed with the outcome. Of course I would have liked to have done more but that is always the case.

809. You are not actually saying that "reasonable" is the same as "satisfactory" I take it?
A. I am saying that I am sufficiently pleased with the result.

810. The patient is doing as well as might be expected! Let me turn to the strategic alignment initiative. Would you tell me how that is getting on and what do you hope to achieve from it?
A. The purpose of strategic alignment, and it relates closely to Pathfinder, is to ensure that in this age where there are going to be less funds available for the research and innovation process that we are making between ourselves and industry the best use of the funds that are available, both on the industry side and on our side. So under strategic alignment I and the manager in the DRA who has specific responsibility for an individual company go together and visit that company and we describe the research that we see for the future coming up in the area where they have competence. They, if they feel inclined, and so far—in a sense relating to the previous question where it was suggested that companies are less inclined to talk to us—I have not come across such companies and all the companies we have been to see so far have been quite happy to replay to us their own research plans. That enables an understanding of where the two are going. For instance, on our side we can see that industry, particularly on the civil side of its business, is embarked upon a major investment plan which could be of interest to us. We could take account of that in ways in which we are planning our programmes or advising our customers. Similarly in relation to industry we explain to them that if there is a particular line they are interested in which frankly we have decided is going nowhere they can take a perhaps more mature view as to whether that is a good investment of their monies. The purpose of strategic alignment is to share information and to try and get better value out of the total research investment, be it in Government or be it in industry. It inevitably focuses on the large companies, the large companies that do physics based research. In this year I, in total, covered 14 companies. The programme for the coming year will approximately double that.

811. Is that in line with your long-term thinking?
A. I think there are a limited number of companies that do serious research in the physics based field so I think at around 30-ish—

812. That is your limit, is it?
A. It is not limited. I am not saying that I am not going to talk to anyone else beyond 30 but 30 is approximately the size that we have talked about.

813. That is your expectation rather than a limit?
A. Some of those are very large.

814. Let me ask you lastly about dual use. You have started off one Dual Use Centre in structural materials at Farnborough. Can you tell me if that is going according to plan or is it too early to say anything along those lines?
A. Well, you are right in that it was launched only a month ago so I cannot in all honesty claim that I have any solid evidence to say that it is before or behind its plan. What I can tell you is something about progress to date. We have some seven or so major companies seriously interested in participating in it and they cover not only well-known names in the defence field but also some important names in the non-defence field, which I think some Members of this Committee will be pleased about. We have ten universities who are also in conversation with us. We are also attempting to ensure that we properly wrap in the smaller and medium sized organisations who may well not be able to afford to be participants in the sense the major companies are but will still hopefully be able to benefit from the activities going on. Right now, for instance, I am told that we have some 41 SMEs under contract in one way or another so we obviously do provide some input into the small and medium sized company field.

Chairman

815. On this SMEs issue, how many would be involved in any shape or form in this new Dual Use Technology Centre at Farnborough?
A. The number 41 is the number of SMEs that are currently contracted to the Structural Materials Centre at the present time. That is the number with whom we have relationships. They are relationships at the moment of us paying for our research or services from them. Of course, we would hope over a period of time that they would become more active participants but in the first instance I would look for the active participants in the Structural Materials Centre to be the larger companies and the major universities.

Lord Howie of Troon

816. Can you tell me which structural materials you are investigating?
A. We have a very broad range of both metallic and composite materials, those suitable essentially for the aerospace world, the marine world and the vehicular world. It is a very broad span of structural materials, both metallic and non-metallic.

Lord Craig of Radley

817. Are we going to see a further expansion of this concept? Do you have any other Dual Technology Centres in mind?
A. Yes, we have a number. We have currently some seven or so under active discussion. We have ones in the software and electronics field, information technology field and marine and hydrodynamics

[Lord Craig of Radley *contd.*]

field. A number of such centres are under active discussion at the moment. Inevitably they will be launched as and when those discussions mature.

Chairman] Would any Member of the Committee like to ask any other questions other than the general question which I did warn Mr Chisholm I would be asking?

Lord Renwick

818. There is just one, my Lord Chairman, coming out of Mr Chisholm's evidence that on an international basis they would be dealt with Government laboratory to Government laboratory. Do you see the DRA as a candidate for privatisation and if so what would be the implications for the Government to Government cohesion worldwide?

A. My first answer to that is it relates to the question we asked ourselves before about the role of the DRA. If the DRA is to be the shared vision intimate advisor then privatisation of the whole I think would be extremely difficult to achieve.

Lord Dainton

819. It would be wholly inappropriate, would it not?

A. Indeed, my Lord. Let me restrict my answer to being very difficult to achieve if you do not mind. The other model, of course I would argue that it would be absolutely necessary but that is another issue. Under the regime which we are operating I would say that it would be very difficult to achieve. That is not to say, in my view, that there are not very appropriate and pertinent ways in which private capital could be brought into the enterprise. For instance, we have just been talking about Dual Use Technology Centres and I see that it is quite possible in Dual Use Technology Centres one would look towards industry to make a contribution and that would be the introduction of private capital. I think there are many ways such as that in which the organisation could be enhanced by the introduction of private capital.

Chairman

820. Now, Mr Chisholm, I did say at the beginning that I would ask you at the end whether there are any areas we have not covered which you would like to make further comments on, or indeed if there are any issues which you feel we should be addressing and which perhaps you feel we have not yet done so?

A. I think you have given me a pretty good grilling across the whole board!

821. It is your time to grill us now!

A. No, no, I would not be so impertinent. The only point I would perhaps like to end on, that I hope your enquiry would support, is that I believe the DRA is a really rather important national asset. I think that the principal role that I have, and that of my team, is to ensure that the value of that asset is most beneficially unlocked for the nation as a whole bearing in mind, as I said all along, that its main thrust, its principal thrust, has to be focused on its owner and principal customer. The most important point I would like to make is the question of the importance and value of the DRA and the potential it does give us as a nation.

Chairman] Thank you, Mr Chisholm. I can say without fear of contradiction from any of my colleagues on this Committee that we will certainly agree with you that the DRA is a highly important national asset. As I said earlier, we have been most appreciative of the help that we have been given and indeed I should have said that we were most appreciative of the quality of the science and research, and indeed the advice, which we saw manifested in our visits. I think we would agree with you again that the problem you are clearly wrestling with, and we appreciate the scale of the problem, is how in these difficult times of reduced funding and changing priorities you are having to reposition the DRA and, as you say, unlock its potential for the wider country. Thank you very much for all the help you have given us today, we are most grateful to you.

Memorandum from the Defence Research Agency

THE ENTERPRISE FUND

1. The research activities of the DRA are dictated entirely by the money it receives from its customers. The major source of income is from the Ministry of Defence and is all tied to specific work programmes, whether in the field of Strategic Research for the Defence Scientific Staff, Applied Research for the Defence Staff or Project Support for the Procurement Executive. Income from other Government Departments such as the Department of Trade and Industry is also tied to specific programmes, as indeed are funds from non-Exchequer sources, usually private industry.

2. The DRA has no difficulty with this concept of specific allocation since it accepts that its primary purpose is to serve the Ministry of Defence. In the defence sphere its aims and objectives are so closely aligned with those of its major customer that any "private venture" type of work that it considers it necessary to pursue can usually be pursued from within the Strategic Research Programme.

3. The DRA is, however, encouraged by its Framework Document to enter into collaborative arrangements with industry and to develop agreements for the transfer of technology for both MoD and other purposes. There is also growing feeling, as evidenced by the OST's White Paper, *Realising Our Potential*, and by the lines of inquiry pursued by this Committee, that the DRA should have the opportunity to develop its ideas into fields that are not specifically defence-related and that it should be ensuring that the civil, wealth

creating potential of work carried out primarily for defence purposes should, where possible, be fully exploited for the wider benefit of the nation. Finding resources to do this, however, given the very precise—and indeed entirely proper—allocation of the income received from the Ministry of Defence and other Government Departments is a problem, particularly since in the early stages of such developments, there is no immediately assignable customer.

4. The only way of funding these broader aims is through a source of money that is not tied to a particular customer programme. The obvious current source is the income that the DRA receives from licensing and royalty payments on the DRA patent portfolio. Royalty income can be volatile, with foreign currency payments being at the mercy of exchange rates and market conditions and, on occasions, key patents having to survive challenges and re-examination. As a result the income available from this source is highly variable from year to year.

5. In order to ensure the proper management of these funds for the purpose of generating and exploiting wealth creating ideas, the DRA has set them up in the form of an "Enterprise Fund" with carefully drawn up guidelines as to how and why they should be dispensed. To pursue an idea for some further research or to develop existing work along a particular route to exploitation, Business Sectors put forward proposals and bids for approval. Examples of applications that have already been made are: the development of commercial anti-counterfeiting and anti-fraud measures; research into light emission from Silicon; commercial exploitation of nitrating compounds, and the development of a seismic detector for use in oil and gas exploration.

6. In addition to funding development and exploitation, it is proposed this year to introduce an incentive scheme using Enterprise Fund money under which Sectors may apply for small incentive awards to be paid to staff who have made a significant contribution to any particular project or idea. Scientific staff tend on the whole to be motivated by the pursuit of their science, but it is clear that our preparedness to make modest awards for outstanding achievement will have an added motivational benefit.

7. As the concept of the Enterprise Fund was only launched in 1993–94, much of the past year has involved the DRA organisation adapting to accommodate the possibility of running independent, non customer-programmed work. In the event proposals involving expenditure of some £250K in total, mostly falling in 1994–95, were put forward and little of the DRA's royalty income of £15M was used for Enterprise Fund purposes. Now that Sectors are becoming aware of the opportunities available to complement their existing projects, and the process and mechanisms are in place for managing the Fund, we expect considerable demands on Enterprise Fund resources in the coming year. Amongst promising proposals in the pipeline are a number of speech recognition and speech processing applications, a collaborative development of large area, flat screen video displays, exploitation of TenDRA, a software technology for Open Systems, and developments of two environmental sensors —OTIM, a passive gas cloud imaging system and ASCREV, a real-time continuous water pollution monitor.

8. Although the size of the Enterprise Fund is small compared with the DRA's total turnover, it is going to be of vital importance in ensuring that the DRA has the ability to exploit the wealth creating potential of research that may not be relevant to its primary defence aims, but which may nevertheless be of value to industry or the community generally. Unless we in the DRA are able to do this, then we will not be able to achieve that added value which both the Government and taxpayer have a right to expect from their initial research investment.

Supplementary memorandum from the Defence Research Agency

DRA COMPETITION POLICY

1. A number of Trade Association representatives have expressed renewed concern over DRA's competition policy. This paper is intended to provide an authoritative statement of DRA policy together with facts about the relationships between DRA and industry.

Background

2. At the time of the DRA's launch there was a considerable degree of uncertainty in MoD, industry and DRA as to precisely what the Agency's relationship with the MoD should be. Should it be just another contract research organisation having to compete with industry for virtually all of its MoD business, or should it enjoy a special relationship with its primary customer? And in the latter case, what would be the role of competition?

3. Over the last 3 years this uncertainty has been largely resolved and the MoD has confirmed that it regards the DRA as being its principal provider of independent scientific advice. The MoD has, however, always been keen to ensure that the DRA offers the best value for money and whilst it welcomes the good progress made in cost reduction and internal efficiency within the DRA, it is nevertheless keen to ensure that the prices charged by the DRA are competitive. To this end, it has placed a requirement on the DRA for a

degree of competition. It is important to understand that the purpose of the competition is to provide an incentive to keep DRA sharp; it is not principally aimed at changing the in-house/outsource balance. The table below shows that a large part of the DRA's business is already outsourced, particularly in its core area, the Applied Research Programme.

	DRA Total Income	*Amount Subcontracted*	*Percentage Subcontracted*
MoD Applied Research Programme	447	211	47
MoD Strategic Research Programme	63	25	40
Project Support	113	28	25
Other MoD Customers	91	28	25
Non-MoD S&T Services	50	16	32
Total	764	308	40

The Applied Research Programme

4. The ARP is composed of 63 Packages each representing the totality of the technical issues relevant to a particular military function. Package Managers (who are within the DRA but separate from the Sectors who own the laboratories which conduct the scientific work) each divide their Packages into up to 50 Assignments which they place as internal contracts on DRA Sectors. Assignment Managers within the Sectors manage the delivery of the assignment through a combination of work in their own laboratory, work in other laboratories, and work subcontracted to industry and universities.

5. The MoD requires the Package Managers to do the job of integrating and co-ordinating the various assignments within a package. To introduce an incentive to good performance MoD has asked Package Managers to subject up to 24 per cent of ARP funds to what is known as Secondary Competition.

6. Secondary Competition is the process by which Package Managers seek offers from industry for the management and execution of Assignments. Under Secondary Competition all the work to be competed would previously have been conducted under DRA Assignment Managers, and therefore Secondary Competition can only lead to a net transfer of work from DRA to industry. Competition under this heading only began in earnest this year, 1994/95; so far customers have agreed that 50 assignments should be benchmarked by Secondary Competition over the next two years.

7. In addition to the Secondary Competition process, the Pathfinder process allows industry to bid directly to Package Managers before even the formalisation of the assignments. Package Managers describe to industry the overall scope of their package and call for offers of any research proposal that matches its objectives. They then assess the Pathfinder proposals against the programme put forward by DRA Assignment Managers and incorporate the best selection of assignment and Pathfinder proposals that meets Package objectives. Successful Pathfinder proposals are therefore considered to have been selected competitively against other proposals and against DRA assignment offerings.

8. As well as secondary competition and Pathfinder, the DRA is committed to maintaining a continuous process of benchmarking across the whole ARP (and the other S&T programmes) to measure performance in terms of efficiency, delivery, and quality. Robust measures are not commonly available in each performance dimension (notably quality) but the commitment to measurement and reporting has already demonstrated clear advantage in terms of improved performance.

The Strategic Research Programme

9. The SRP is DRA's equivalent of a private venture research programme. Because MoD owns DRA and both organisations' objectives must be the same, MoD funds the SRP and retains ultimate control over its contents. Nonetheless the mechanisms for the programme creation are organic within DRA. Research scientists bid for corporate funds in just the way they would if it were a pure DRA PV programme. The bids are assessed and balanced through a peer group process overseen by DRA's Technical and Quality Department. Finally the whole programme with some redundancy is put to MoD for selection and funding. Because of its intimate importance in regeneration of DRA technology the SRP is not open to competition, but 40 per cent is subcontracted (much of it to universities).

Project Support and other MoD and non-MoD Customers

10. The knowledge and understanding that DRA acquires through its research means that it is also able to provide an important and highly valued service to the PE, to other MoD customers and to non-MoD customers. The degree of open competition that is appropriate will vary from customer to customer and is a tactical question for the customer to decide. Most of the work that customers ask of DRA requires an

assurance of impartiality with respect to conflicting commercial interests. This still leaves room for competition in much of the project support work for the PE, but the category of other MoD customers includes a mixture of competed work (for instance Quality Assurance Testing) and some highly specialised work not suitable for competition.

11. DRA's policy for all these customers is to manage its capabilities such that it retains the core competencies necessary to fulfil the needs that cannot be met elsewhere. For non-MoD customers DRA limits the scope of its activities to areas where its involvement furthers the interests of its owner. Thus DRA will compete for work where its execution will help sustain capability which might otherwise become non-viable, or where such work might make facilities, or capabilities, more affordable for MoD customers.

Industry's concern

12. From evidence gathered, mostly informally, by the DRA it appears that industry has two major concerns about the DRA's competition policy. Firstly, it is concerned at the possibility of losing market share to the DRA as a result of DRA bidding for work that has in the past been carried out by industry. And secondly, industry questions the ability of the DRA to run competitions at secondary level where it is both bidding for work and judging the outcome of the competition. This matter concern may go wider than just secondary competition since it has been suggested that DRA could damage its ability to provide independent advice to the MoD in judging competitions between major contractors when it may already have actual or potential sub-contract work for one of these contractors.

Loss of Market Share

13. Looking first at the question of market share, it is the DRA's view that industry has little cause for alarm. By far the largest part of the competitive arena between defence industry and the DRA is the Applied Research Programme and some part of the Project Support that DRA currently provides to MoD. The way in which this is being opened for competition—through primary and secondary competition and Pathfinder—actually means that industry will have access to more, not less, defence research funds. Indeed, over the next four years this could build to £120 million, all of which would be *additional* market for industry. Whatever percentage industry collectively wins of this market it must be to industry's net benefit.

14. The corollary of opening Project Support to primary competition, of course, is that DRA will be able to compete for that work which has in the past, because of manpower limits, by-passed the research establishments and gone straight to industry. The scale of this is difficult to quantify, but present indications are that it is a small fraction of the market now open to industry.

15. It has been suggested that one consequence of what must inevitably be an increase in opportunity for industry, is that DRA will seek to claw back contracts which have traditionally been placed on industry in the Extra Mural Research (EMR) programme—and which have served the very vital purpose of allowing ideas generated in the DRA to make the transition from MoD research laboratory to the private industrial sector. DRA recognises the danger and has responded with a policy that depends very heavily on ensuring that the best of what industry can offer is incorporated into the defence research programme as a specific means of maximising its value to the MoD and to the nation at large. It is also worth pointing out that the amount of extramural research as a percentage of intramural research has evolved over the last three years as shown in Table 2. And the DRA has no plans to reverse the trend.

	1991–92 *Per cent*	*1992–93* *Per cent*	*1993–94* *Per cent*
Percentage by value of EMR to IMR	50	61	62

Loss of Independent Adviser Status

16. The DRA has always recognised that there could be presentational difficulties in being seen to be both the judge and the competitor for secondary competition, and also in being both the adviser to the MoD in the procurement of equipment and sub-contractor to the main producer of that equipment. In the former situation DRA is in no different position from any other Prime Contractor. However, in recognition of its duty as a public sector organisation, to operate with maximum transparency, the DRA has set up a review mechanism—know as the Market Testing Review Board—to ensure that each secondary competition is judged absolutely scrupulously and with no element of favouritism towards the in-house bid. The MTRB has representations from the MoD, in its capacity as both customer and owner, and from private industry as well as DRA corporate executives; indeed the first two elements form the majority.

17. The question of being both an independent adviser and sub-contractor has not so far produced any specific complaints from industry and indeed the DRA is confident that its "Chinese Walls"—a concept not unknown in industry—will ensure that conflicts of interest do not arise.

18. In any event DRA's position is supported by two further policy commitments that ensure its even-handedness.

- DRA will always offer the same range of services to all tenderers for MoD business and will not enter into any exclusive deals for contacts where the ultimate customer is MoD.
- DRA will always allow the PE an absolute veto on its involvement in any subcontract for MoD business.

While these policies probably reduce the attractiveness of DRA as a subcontractor they are necessary to reinforce its primary role.

THURSDAY 19 MAY 1994

Present:

Craig of Radley, L.	Selborne, E. (Chairman)
Hilton of Eggardon, B.	Trefgarne, L.
Platt of Writtle, B.	
Renwick, L.	Dainton, L.

Supplementary Memorandum from the Ministry of Defence

1. *What are the MoD's latest 5-year budgetary projections for expenditure on defence research in general, and for the DRA in particular, in the light of the November PES statement?*

Cm 2250, "Realising Our Potential", published in May 1993, indicated that spending on defence research was expected to reduce by some 15 per cent over five years, during which time the rationalisation of the DRA would bring substantial efficiency improvements. Plans over that timescale remain for a reduction of broadly the same order, although principally, owing to a faster than expected efficiency improvement, a marginally greater reduction is now expected. The level of expenditure with the DRA will depend upon the Agency's ability to win defence research contracts in competition. Scientific and technical support to MoD is currently under scrutiny as part of the Defence Costs Study. The outcome of this exercise may also have implications for the overall level of expenditure on research.

2. *Dr Pope (question 6 of transcript) refers to the value of Technology Demonstrator Programmes in highlighting the difficulties that can arise when bringing together several different pieces of technology into a system. However, there is among many an impression that fewer and fewer Demonstrator Programmes have been funded and more and more systems failures have occurred. Could the MoD quantify the funds allocated to Technology Demonstrator Programmes for the past ten years (1984-1994) and in the LTC programme, showing how the costs break down between the separate areas of technology?*

As can be seen from the attached graph (Annex A, figures before 1986 not readily available (*not printed*)), investment in Generic Technology Demonstrater Programmes (TDPs), ie those with wide ranging application, has fallen since the mid-1980s. In recognition of this, and bearing in mind the value of Generic TDPs in reducing risk, revised arrangements for handing them within the MoD's Long Term Costing exercise have been put in place. This will involve grouping together Generic TDPs from all areas in order to give greater visibility of them, to ensure that proper consideration is given to their potential value. We are not in a position at present to give projections for future years.

3. *To what extent does MoD audit the Chinese Walls that the DRA operates (questions 18, 19) between bidding and evaluating bidding? Would the MoD consider publishing its audits, or finding some other means to improve confidence in the Chinese Walls?*

A Market Testing Review Board has been established whose MoD members include an Owner's representive (the Director of Procurement Plans) and a representative of MoD Customers (Director Research (Programmes)). Industry's confidence in the audit process is secured by membership of two senior industrialists totally independent of both MoD and DRA—representing the Defence Manufacturers Association, and the Defence Industries and National Defence Industries Councils.

The Board's role is

- to ensure that in all respects, DRA's market testing and secondary competition activities are conducted in a way that is both fair and reasonable
- to check that the DRA's "Ombudsman" is discharging his responsibility effectively
- where things go wrong, to ensure that the DRA is acting not only to remedy the problem, but also that it does not recur.

The Board meets twice yearly under the chairmanship of DRA's Commercial Director and reviews in depth not only the DRA's on-going market testing and secondary competition programme, but also all written complaints received, from whatever source. For reasons of commercial sensitivity, the Board makes no public report, but it does advise CE DRA on the adequacy or otherwise of DRA's arrangements for the integrity of its processes and procedures and recommends necessary changes.

4. *Mr Bell (q 32) informs the Committee that "in extremis the Secretary of State may direct that a facility which is not commercially justified must be retained . . . and that the DRA must not be financially disadvantaged by this process". What happens in the reverse case? Can the MOD order the Chief Executive to close a facility he wants to keep open but which the MOD feel is a waste of public money? If they can, from whom would they take advice in order to reach their decision?*

The MOD is confident that this case is not realistic. The introduction of a trading relationship was designed, inter alia, to identify those functions and facilities which were not commercially justified and to take action to reduce their costs. As the early action taken by the Chief Executive to resolve commercial difficulties in the Quality Assurance Technical Services in response to a shortfall in demand has illustrated, this objective has been met in practice.

The Chief Executive, as Accounting Officer for the DRA, is of course responsible, within the terms of the Framework Document, for the efficiency and value for money achieved by the Agency.

5. *Dr Pope (q 57) mentions that the responsibility for LINK is being transferred to the OST and that a fundamental look is being taken at its rules. In view of the difficulties the MOD has experienced with LINK, how would the MOD wish to see the rules changed?*

MoD and OST officials have already had initial contacts to establish what might be done to change aspects of the LINK scheme in order to increase MoD participation. Some procedural changes might be achievable and beneficial but there remains a fundamental difficulty in that, although Government departments contribute to LINK to meet their own objectives, the primary purpose of this initiative is seen as being to pull through technology from the science base to industry for the benefit of the latter. Consequently, under EC rules, the Government contribution is limited to 50 per cent of the total cost. At a time when the defence market is contracting, industry can seldom be persuaded to put as much as 50 per cent funding into defence orientated work particularly where, as in LINK, some of this is undertaken in an outside institution. MoD continues to pursue other means of strengthening its partnerships with industry, the DRA Pathfinder initiative being a good example.

In parenthesis, the MoD would like to take this opportunity to apologise for and remedy an error occurring in its earlier written evidence on LINK. The sentence describing the DRA's involvement in answer to Question 3.4 should have read

> "The DRA is or has been involved in 8 LINK projects, its commitment being worth about £1.3M"

The rest of the sentence as currently written is inaccurate, and should be deleted.

6. *In which EUCLID and EC Framework projects does DRA participate, and with what financial contributions?*

EUCLID

The EUCLID programme covers 15 generic research areas known as Common European Priority Areas (CEPAs); of these 13 are currently "active" and the UK participates in 12—see Annex B *(not printed)*. CEPAs currently consist of 42 individual Research Technology Programmes (RTPs) and of the 28 actively being implemented, the UK is involved in 20—see Annex C *(not printed)*.

There are two basic types of EUCLID project and the DRA participates in both. In type "A", the DRA manages extra-mural contracts placed on behalf of the MoD and receives a fee for this service. In type "B", the DRA functions as a sub-contractor within a multi-national consortium which competes against other consortia for EUCLID business.

Type A work consists of some 11 RTPs worth £10.8 million to the MoD and DRA out of a total contribution from participating Governments of nearly £58 million. This clearly represents very good value for money in the UK. Type B work covers seven RTPs worth £7.2million to MoD/DRA out of a total of £31.6 million. All money used by the DRA for EUCLID programme comes from MoD, mainly from the Applied Research Programme.

EC FRAMEWORK

The DRA is currently involved 14 EC projects mainly BRITE/EURAM and ESPRIT worth about £5.52 million. In four cases the funding is sourced in three ways (EC, MoD and DTI), but the rest are 50 : 50 EC and MoD. In FY93/94 MoD contributed some £0.96 million (about 41 per cent) towards work worth £2.36 million. This year and next the values drop off as contracts are completed and there will be a "trough" until new proposals are issued and contracts are negotiated. The table at Annex D attached shows individual contracts contributions and values (*not printed*).

7. *Please could the MoD give illustrations of the kinds of eventualities that were of concern in the drafting of paragraphs 6.6 and 7.5 of the Framework Document?*

The first was specifically intended to deal with the possibility that were the DRA a major sub-contractor to one of MoD's large prime contractors, there might be difficulty in accepting as truly independent advice given by DRA regarding that prime. The second was intended to counter the possibility that the DRA, through collaboration and co-operation with a particular defence contractor, might put the latter in such a strong position with regard to a particular technology as to make it very difficult to hold a true competition for subsequent development and production.

DRA has formally made a commitment to MoD as its primary customer, but recognises that on the one hand, some MoD customers expect DRA to remain commercially independent and sufficiently impartial to advise on the best technological solution, regardless of the source, whilst others require DRA to compete to provide specific and authoritative advice. The corporate Technical Strategy published with the latest Business Plan specifically addresses how the dichotomy between the values and perceptions of such disparate MoD customer areas should be addressed. DRA is already in discussions with the Department to develop and implement its strategic commitment to building a high degree of trust between itself and the differing customer areas.

8. *How is the line drawn between DRA and other apparently cognate activities funded by MoD, such as the Defence Operational Analysis Centre, the Army Personnel Research Establishment, the Institute of Naval Medicine, the Institute of Aviation Medicine, and the Stores and Clothing R&D Establishment? Is there a risk of duplication of effort, or of outmoded boundaries remaining in place?*

The organisations referred to in the question exist to fulfil different purposes. Inevitably however there are some areas of shared interest and, while the Department's aim has always been to avoid duplication, the risk can never be entirely discounted. This question is being looked into as part of the Defence Costs Study. A special study has been set up to examine all aspects of scientific and technical (S&T) support to MoD. Amongst other issues, the team is exploring the scope for improving overall value for money through changes to the existing S&T organisations.

In advance of this Study, and in recognition of the benefits to be gained through greater rationalisation in the human factors field, the MoD is currently consulting with the Trade Unions over a proposal to bring together the bulk of the human factors research in the MoD and to place it within DRA management with effect from 1 April 1994. This proposal involves 270 civilian staff and 90 service personnel, most of whom are in the Institute of Aviation Medicine and the Army Personnel Research Establishment at Farnborough. It is the eventual intention that the human factors resources will be fully integrated into the DRA Trading Fund, but for a period of up to two years whilst details are worked out, they will remain vote funded, although under the management of the Chief Executive, DRA. This new human factors grouping with in the DRA will be known as the Centre for Human Sciences.

9. *MoD's memorandum says that Pathfinder is a likely candidate for a "policy evaluation exercise". Within what framework? An MoD evaluation, or an OST one, or what? And when is this expected to take place?*

As Treasury published guidance makes clear, policy evaluation is a comparison as well as a test of achievement; an attempt to judge what has happened as a result of the policy as compared with what would have happened otherwise. Following on the commitment at para 4.10 of the "Realising Our Potential" White Paper, DRA itself will therefore be looking closely at the impact of its Pathfinder initiative, and reporting the outcome of its assessment in the Agency's Annual Report for the year ending 31 March 1995. In the meanwhile DRA is monitoring the effectiveness of its Pathfinder programme year-on-year; changes naturally flowed from the assessment of the outcome of the 1992 Pathfinder conference.

10. *The Framework Document, para 5.7, refers to the 1992 IPR Concordat between MoD and DRA, which presumably governs what happens to royalties. Could the Committee have a short statement on how royalty income arising from DRA work is handled. In particular, what percentage of its goes back to DRA, and on what terms?*

In accordance with the Intellectual Property Concordat agreed between the MoD and the DRA in March 1992, all income from intellectual property generated in the research establishments prior to the setting up of the DRA and all income arising from work carried out at DRA since its creation is retained by the DRA. The MoD is, of course, able to make use of any of this intellectual property without charge in respect of procurement for defence purposes.

11. *In a letter to the Chairman of the House of Commons Select Committee of Defence of 29 June 1993 the Minister of State for Defence Procurement talks of a target of 100 per cent competition in four year's time for work carried out for the Procurement Executive. Similar figures are given in the Next Steps Review 1993. MoD's memorandum (para 3.8) speaks of "only the Project Support work" being currently subject to primary competition, with the aim of 100 per cent by the end of 1995–96.*

(a) When the letter speaks of work carried out for the PE, does it mean Project Support (and only Project Support)? If yes, is there a discrepancy in the timescales referred to in the two documents? If no, can we have clearer definitions of what is being referred to in the two documents?

Work carried out by the DRA for the PE is indeed known as Project Support. There is no discrepancy in the timescales as DRA is not the exclusive provider of such. There are therefore two targets—for the PE as a whole, and for work in areas seen previously as the exclusive prerogative of DRA.

(b) What does the letter mean to say that the 1993–94 target for competitive proposals in secondary competition is 3 per cent of turnover, and sub-contracting 24 per cent? Isn't all secondary competition at the level of sub-contracting? Could the MoD explain the terms used here?

"Secondary competition" means choosing (mainly in the MoD Applied Research but also in Project Support programmes won by DRA) by means of competitive tendering at assignment or task level, between a DRA in-house bid and potential external suppliers. Assignments may be proposed for competition by the MoD Customer, or the DRA Package Manager on behalf of the customer. The target for 1993–94 was therefore that DRA should offer to industry and teams within its own Business Sectors the opportunity to tender for some £21 million of work. In the event, DRA is forecasting some 3.9 per cent of its turnover as having been subject to secondary competition, with the majority of the contributions arising from the Pathfinder process.

"Sub-contracting" is basically outsourcing, research undertaken extra-murally for the DRA by the private sector or academia. It arises because a decision is made at an early stage to seek only external tenders for either strategic business reasons or on the grounds of anticipated lack of competitiveness in an in-house tender. The 24 per cent target was achieved by the end of 1993, and over 30 per cent target is anticipated by 31 March 1994.

12. *Is it possible in principle for DRA to be in competition with a foreign source at the level of primary competition, or for DRA to entertain bids from foreign sources at the level of secondary competition and of sub-contracting? Are there any examples of such practice?*

PRIMARY COMPETITION

There is no primary competition at present in the Applied and Strategic Research programme but the DRA does compete at the primary level for Project Support work although there are only a few examples available so far. It is perfectly possible that DRA could find itself competing against a foreign supplier; no examples have however yet emerged. It is, of course, for the MoD to decide which sources, foreign or otherwise, could compete for work at the primary level.

SUB-CONTRACTING

The DRA has always sub-contracted by competition a degree of its work with overseas companies, notably equipment manufacturers from the US.

SECONDARY COMPETITION

To date no competitions which could be construed entirely as pure Secondary Competition have been run, although Pathfinder proposals fall loosely with the definition. There is, however, no reason in principle why foreign bids should not be accepted subject to the usual security caveats.

Further Supplementary Memorandum from the Ministry of Defence

(1) The evidence mentions the corporate Technical Strategy. Would it be possible for members of the Committee to be provided with a copy of this?

The DRA's corporate Technical Strategy was published *in draft form* as Annex P to the 1994–95 Corporate Plan, and outlined in Part A, Chapter 2 (copy attached *(not printed)*), the possible forms of strategic relationship with MoD; the Technical Strategy document itself is still evolving as DRA concludes its descussions with its Customers. The DRA's preferred role as a "strategic asset" was discussed by the DRA Council at its meeting on 30 March 1994, approved and recommended for endorsement by Ministers.

(2) In Annex A a graph is printed concerning technology demonstrator programmes. However, there is no indication as to what the units on the vertical axis represent, and the Committee would be grateful for clarification.

The units on the vertical axis represent £million over the 10 year period covered by the particular Long Term Costing period denoted in the horizontal axis. Thus, LTC86 provided for some £870 million anticipated spend over the period 1 April 1986 to 31 March 1996, whilst initial estimates of LTC94 show provision for some £480 million over the period of 1 April 1994 to 31 March 2004.

(3) While the Committee are grateful for the clarification given on page 11 of the evidence in response to their question 11, part B, it would be of help to know whether, in the paragraph at the end of that page on subcontracting, the reference to research undertaken extramurally means, strictly, only applied research, or also refers to extramurally contracted project support.

The reference to "research undertaken extra-murally" does NOT refer exclusively to applied research, but to research required in any customer area where effectively DRA does not or need not have the relevant in-house capacity/capabilities to undertake the work.

Further Supplementary Memorandum from the Ministry of Defence

NOTE FOR HOUSE OF LORDS SCIENCE AND TECHNOLOGY COMMITTEE ON MOD AND DRA FACILITIES AT PYESTOCK

1. The Pyestock site, formerly the National Gas Turbine Establishment, belongs to the MOD's Director General Test and Evaluation (DGT&E). The DRA is a lodger on the site where it still has a number of research facilities. The references to the various facilities by the Rolls Royce personnel who appeared before the Committee cover both Test and Evaluation (T&E) and DRA assets. A brief description of each is set out below:—

Engine Altitude Testing Facilities (T&E) Rolls Royce (RR) is by far the major user of these either in the role of MOD prime contractor for military engines, or as a repayment customer.

Noise Test Facility (DRA) This represents a unique capability within Europe to measure jet engine exhaust and turbine noise at model scale. For its operation, it relies upon the Pyestock compressed air generating plant owned by the Test and Evaluation agency. For 1994/95, it is proposed to operate the facility for 200 hours with approximately 75 per cent of the costs coming from the DTI CARAD budget and the remainder from selling time in the facility directly to industry, principally Rolls Royce and associate companies. There will be no MOD funding of noise research in the Noise Test Facility in 1994/95 but proposals for future MOD research through the Strategic and Applied research programmes are envisaged.

Compressor Test Facility (DRA) As Mr Ruffles states in his evidence this is currently closed because the steam drive system was uneconomic to operate. Efforts are being made to re-open it although it does seem unlikely that the expenditure required would fall within the DRA guidelines for capital spending. Rolls Royce have themselves moth-balled a similar facility at Bristol and have given assurances that the testing workload (both project and research) can be met by their remaining compressor test facility at Derby. Detailed experimental data from research compressors is essential to maintain the existing excellent UK design capability.

Combined Facilities (DRA) These provide valuable experimental support to MOD and DTI-funded research programmes and also undertake limited repayment work for industry. They include a capability, unique within Europe, for making measurements of the combustion processes right inside a combustor, crucial for understanding the formation of emissions, undesirable both for environmental and also for tactical reasons. The facilities are making a significant input into an EC supported research programme addressing low emissions combustion technology. Although owned by the DRA, some are dependent upon the Pyestock air supply plant that is part of the T&E.

Turbine Facility (DRA) A turbine aerodynamic test rig at Pyestock was shut in 1992 as a savings measure, as stated by Mr Ruffles. However, DRA still operates a major transient turbine heat transfer facility (the Isentropic Light Piston Facility or ILPF). This has recently been upgraded and represents a unique research capability within Europe. The facility is currently fully committed to an EC supported research programme (through the BRITE-EURAM initiative) investigating turbine film cooling. The research is co-funded by the MOD, DTI and by six European engine companies including Rolls Royce.

A further Pyestock facility not referred to in the House of Lords transcript but owned by the DRA is the Glen sea level engine test bed. This bed can accommodate military engines such as the Spey or RB199 and is dedicated to research into advanced engine control systems. As well as supporting MOD and DTI funded intramural research, it is also used by Rolls Royce and the fuel and engine control systems supply industry (eg Lucas Aerospace) for evaluating mechanical and electronic hardware and assessing advanced control laws.

2. During the years 1979 to 1986 well before the establishment of either DGT&E or DRA there was extreme and continuous pressure put upon RR by MOD to take over responsibility for all the Pyestock facilities. Other companies, eg Dowty, Lucas, Vickers, BAe, GEC were also approached. All declined to take on the responsibility.

3. Efforts were then made by MOD to negotiate a deal on terms dictated by RR. However the RR demands were seen as a high price to pay for the cost of the transfer of 750 civil servants to RR. They included:

(a) 40 per cent increase in MOD contribution to annual running costs relative to existing levels;

(b) free transfer of assets;

(c) MOD responsible for redundancy cost;

(d) MOD indemnity for effects of TUPE reading across to other RR employees;

(e) MOD to pay transfer costs in respect to pension entitlement of staff transferred.

And it proved impossible to devise an arrangement acceptable to both sides.

Present position

4. After the Engine Test Facility at Pyestock became part of DGT&E on 1 April 1992 the question of possible privatisation was re-activated. DGT&E has decided that the first step should be to undertake a feasibility study into this proposal which will, amongst other things, assess the likely commercial interest in Pyestock and specifically that of RR. The feasibility study will be undertaken by consultants and the invitation to tender has already been issued. The study team is due to report in August 1994.

5. Although the DRA's research facilities were included initially in the privatisation debate in the early 1980's, it was decided subsequently that this was not realistic and the later stages of the discussions with RR concentrated on the Engine Test Facilities now owned by T&E. Similarly DGT&E's current proposals concern only the T&E facilities. If privatisation of these latter goes ahead, the DRA would need to obtain agreement for the continuation of their noise and other facilities on a privatised Pyestock site.

Examination of witnesses

MR JONATHAN AITKEN, a Member of the House of Commons, Minister of State for Defence Procurement, MR PETER EWINS, Deputy Chief Scientific Adviser, MR PAUL SUTCLIFFE, Assistant Chief Scientific Adviser (Research) and MS DIANA SEAMMEN, Assistant Under Secretary of State (Finance), Procurement Executive, Ministry of Defence, called in and examined.

Chairman

822. Welcome to your and your team, Minister. We are grateful to you for joining us today. As you know, this is the last day of oral evidence that we are taking on our enquiry into the Defence Research Agency and I know that there are a number of areas on which we seek your advice and help. I do not know whether you would like to say anything by way of introduction, Minister, or whether you would perhaps like to introduce your team?

(*Mr Aitken*) My Lord Chairman, thank you for this opportunity to come and give evidence to your Committee. I should indeed be grateful for the chance to introduce my team, and will do so now. Mr Peter Ewins is the Ministry's Deputy Chief Scientific Adviser. He has full responsibility for the MoD's research programme as well as acting as the customer for the strategic research programme. His other responsibilities include being the MoD member of the official committee on science and technology and liaising with other government department on these issues. Mr Paul Sutcliffe is the Assistant Chief Scientific Adviser, Research. He is responsible for scrutinising the research programme to ensure that it is well focused and properly balanced both in terms of its relevance to defence objectives and from the viewpoint of technology. He acts as the customer for the strategic and technology research programmes and he is the sponsor for international and national research collaboration including liaison with the civil departments. Diana Seammen is the Assistant Under-Secretary for Finance in the Procurement Executive which can be simply described perhaps as the finance director for the Procurement Executive and in this context she has the department's ownership responsibilities for the Defence Research Agency. She works to the Deputy Under-Secretary for Defence Procurement, Mr Michael Bell, who is the Fraser figure for the Defence Research Agency. He has given evidence to you already and I am sorry that owing to a commitment in Brussels he is not able to be with us today. That is my team, my Lord Chairman. We have followed the deliberations of your Committee with great attention and we are delighted to try to answer your questions today.

823. Thank you very much. We have circulated a list of possible questions and I expect that members of the Committee will wish to range fairly broadly and I am sure that will not surprise you. May I start by referring to the first question on the list and refer to the report by Sylvie Trosa. We asked Mr Chisholm last week whether he would like to identify how much of that report referred to the Defence Research Agency and he was very circumspect. Nevertheless it is the case, is it not, that the report identifies some difficulties that departments appear to have had in operating the new agency arrangements and I wonder whether you would like to comment on how the Ministry of Defence finds the relationship in practice works out with this very large agency, the Defence Research Agency, and what particular problems you feel will have to be addressed in this respect?

(*Mr Aitken*) My Lord Chairman, on the Trosa report, we have naturally read this carefully, and also the Fraser report, which has figured in your deliberations. There are some points of great relevance to us, but in general we think that our arrangements for the Defence Research Agency already meet most of these reports' suggestions and in some ways are already a step or two ahead of the Trosa and Fraser report suggestions. For example, we already have in place the recommended ministerial advisory board which we call the DRA

[Chairman *contd.*]

Council, which I chair. We do have already in place a Fraser figure who is the Deputy Under-Secretary, Mr Michael Bell. I think I should emphasise that the Defence Research Agency and the Ministry of Defence are not two distant peaks staring out at one another with only rare communications; in fact there is a very good informal working relationship at many levels. I made a rough calculation this morning that I myself have had meetings or conversations with the chief executive of the Defence Research Agency probably 50 times since I became a minister: there are plenty of informal exchanges. The relationship works on a simple working level. As to the question about the customer-ownership relationship there are some difficulties of what might be called creative tension here, but on the whole the results are positive. We do not feel that there are any major gaps or problems and the relationship as a working one flows on the whole reasonably well.

824. May I explore further the owner relationship rather than the customer side. It is the owner side that I am perhaps not entirely clear about. It seems to me that in respect of owner of the Defence Research Agency there are in fact two aspects to this. One is the shareholder. You possess an asset, you wish to see it prosper and get a return on it. Secondly, you are also the regulator. You have to set the rules effectively under which this agency operates and within the framework agreements and other agreements you are requiring not as shareholder but as regulator to move in a rather different mode of operation. Is there a confusion therefore in the role of the Fraser figure? To what extent is he operating as the shareholder and to what extent is he operating as the regulator?

(*Mr Aitken*) I do not think there is great confusion, my Lord Chairman. Like so many constitutional arrangements in this country, including perhaps the relationship, if I may make a constitutional comparison, between your Lordships' House and the other place in which I sit, it is rather opaque, this relationship, seen from the outside, but once you are inside it works quite well. I will ask in a moment, if I may, Diana Seammen who is really there at the coal face on this ownership relationship to come in. In my observation the Fraser figure, Mr Michael Bell, is in good and regular communication with the Defence Research Agency top team, including the chief executive, as am I, as I said a few moments ago. In terms of the framework document to which you referred, the framework agreement, I think that we do not see this as a document of holy writ. We see it more as a flexible manifesto if one reads closely some of the points that your Lordships have raised in this Committee. We think that on the whole there is sufficient flexibility in the framework document and the guidelines laid down by that for a sensible and wise owner figure or Fraser figure to have a good relationship which does not inhibit and prevent the Defence Research Agency from carrying out any of the roles that it is likely to want to carry out. Perhaps Diana Seammen could just comment from the point of view of someone who is actually working there in the ownership role.

(*Ms Seammen*) I very much agree with what the Minister says, my Lord Chairman. In practice we do not find any difficulty in reconciling these two roles which you identified; I think because we have a very clear interest in seeing the Defence Research Agency succeed within the flexible framework and the particular aim which that framework document gives the Defence Research Agency. We are not in it simply for what we can get out of it—and I might observe that in practice dividends would go to the Treasury rather than the Secretary of State for Defence, but the Defence Research Agency is not yet in a position where it is paying dividends. There are a number of points which we would see as being those for a regulatory function but they are really those which I think can be well reconciled with those of a shareholder, that is, we see ourselves very much as looking to monitor the progress of the Defence Research Agency against its key targets which we have devised very much in conjunction with the chief executive of the Defence Research Agency. We start from the statutory objective of return on capital employed but aside from that very much cover the sort of areas that you would expect, subsidiary financial objectives, quality objectives and some objectives which relate to efficiency and the degree of competition. I think that we should want to be doing those both as shareholder and as regulator. We do not make that kind of distinction in our minds. In practice, as the Minister said, we have a close relationship with the Defence Research Agency and I see their finance director and their company secretary very regularly, and their Chief Executive with Michael Bell, the DUS(DP). We have an evolving relationship, I think. We have completed the first year; we are just into the second year of trading. I think it has gone very well. The quality of relationship I think is high.

825. One area where we recognise that the Defence Research Agency suffers from some difficulty and, indeed, so does the Ministry of Defence, is in the treatment of facilities which may be needed for the wider defence industry's purposes but are not necessarily cost effective for the Defence Research Agency. I am thinking of wind tunnels, tanks and the like, for instance. In these cases it would seem that a rather more flexible approach to marginal costing might be helpful certainly to the Defence Research Agency and possibly appropriate if it allowed better use of these facilities and a more realistic costing. But equally I am sure that at that moment the Treasury take an interest and would require to be convinced that this was an appropriate way to handle it. Is this a job for the Fraser figure? It is certainly a job for the regulator to try to negotiate with the Treasury on behalf of the Defence Research Agency. This is an area where I wonder whose job it is to try to achieve this flexibility.

(*Mr Aitken*) My Lord Chairman, may I ask the Deputy Chief Scientific Adviser to pick that one up.

(*Mr Ewins*) My Lord Chairman, I should say at this point that up until about four weeks ago I was Managing Director, Operations, at the Defence Research Agency so please forgive me if I sometimes slip back into that.

826. We are delighted, whatever hat you wear.

(*Mr Ewins*) As to the facilities, my Lord Chairman, I think we have to recognise a sequence of issues. The first point is that even though a facility may be greatly

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under-utilised in terms of the number of hours a week that it is used compared with the number it could be used for, it can none the less be absolutely vital to the Ministry of Defence's interest. You could, for example, have a facility which is used two or three hours a week and because it has such tremendous impact on the MoD's future business, whatever the actual costs divided by the three hours a week that you use it that is the rate that you charge and the Ministry of Defence is prepared and "happy" to pay. What I think we are talking about is those facilities that are not strictly for defence purposes. The Defence Research Agency is left in something of a dilemma as to how it deals with a facility which others would call a national facility. I have in mind not only the wind tunnels that you talked of, my Lord Chairman, but facilities like the hydrodynamic tanks at Haslar, which some of you have seen. Now in that situation I think I should say that the idea of marginal costing is not the way to go. What I think you can do is to drum up some enthusiasm among other non-defence users, use that to offset the costs both MoD and to those users, so that you charge MoD and the other people the same rate but you take advantage of the greater utilisation. That is the way that we have addressed it. The difficulty comes when the Ministry of Defence declares that it has no longer any use for that facility at all and then, of course, both MoD and DRA are faced with the dilemma of wishing to close it or dispose of it but it may be thought by others to be of much more national interest.

827. That is the line that the Committee would be expected to take, but is it the line that you would expect necessarily the Ministry of Defence to take as well?

(*Mr Ewins*) My own feeling is that it is the right line for the Ministry of Defence because at the end of the day we have to bear in mind that we are here to use our money only in those activities that contribute towards the defence of the realm. If there are wider issues about the nation in general and the economy in general I think that they fall outside the Ministry of Defence's strict terms of reference.

Baroness Hilton of Eggardon

828. Yes, but my experience is that because you are required to include the capitalisation costs it then becomes impossible to let those facilities to other people because they are not willing to pay that very high cost so if what you are suggesting is cost of the usage rather than cost of the buildings and setting up the tanks and so on that is where the Treasury rules need changing.

(*Mr Ewins*) The capitalisation is not actually a significant part of the total costs of running a facility in general. Although when the Defence Research Agency was created the capital valuation of facilities took account of the expected utilisation, their age and so on, what is difficult is to retain that facility in mothballed condition, making sure that you are keeping it properly heated and so on. That is what costs money. I do not think that it is simply a question of capitalisation.

829. But if you could let it out you would actually be able to obtain some revenue.

(*Mr Ewins*) That is right. I am not aware of any instance where reducing the facilities to what I think you would know as marginal cost is going to make a significant difference to the amount of that facility's time that you could sell to other interested parties.

Lord Trefgarne

830. Simply because you have not tried it. Mr Ewins was saying how he did not think marginal costing would make any difference to the amount of business that he got, but the fact is, I believe, they have not actually tried it. Those who might be interested in using these facilities know that at the present time they have to pay full cost for the wind tunnel, say. If it was possible to get it at a marginal cost there might, as Lady Hilton suggested, be a wider range of customers. I offer that as a suggestion, not as a declaration of certainty.

(*Mr Ewins*) My Lord Chairman, may I comment?

Chairman

831. Please do, Mr Ewins.

(*Mr Ewins*) I think that that is not quite right in the sense that quite a lot of work is done to look at the market and how much you would have to reduce the price to in order to sell time. Let me take one example. We have the very big wind tunnel at Farnborough, the so-called five metre wind tunnel, which attracts quite a lot of work from people like Boeing in the United States and from others. Originally, before the Defence Research Agency became a trading fund, those facilities were sold at something called marginal cost. My understanding is that it is still up to the Defence Research Agency to decide how to structure its prices provided that the Ministry of Defence is not subsidising the cost to other people. There is quite a lot you can do in that area. You can anticipate the selling of that facility to other people. In that anticipation you can reduce the cost to the Ministry of Defence and to everybody else. The Defence Research Agency does that and it works quite well. The problem is not, in my mind therefore, where there are both MoD and non-MoD customers; it is that the problem arises mostly when the Ministry of Defence withdraws its interest.

Lord Craig of Radley

832. My Lord Chairman, I should like to follow up another aspect of financial control within the Defence Research Agency and perhaps this will flow from looking at the framework document as your flexible friend. Mr Chisholm referred to an enterprise fund which was set up using money from licences and other commercial activities and he quoted as an example lightweight material for the EH101 which actually proved to be potentially a good loudspeaker material. That leads to the question, what flexibility does the Ministry of Defence believe the Defence Research Agency should have to make use of some limited funds with which they could then exploit something like that lightweight material. I should be very interested to know how much freedom the

[Lord Craig of Radley *contd.*]

Ministry of Defence believes that the Defence Research Agency should have in that field.

(*Mr Aitken*) My Lord Chairman, as Lord Craig knows better than anybody else, we have to start from the absolute point that we are here as a Defence Research Agency to do the scientific research which will enable us to have battle-winning superior scientific technologies. That is our raison d'être. But that said there are often spinoffs of considerable quality and interest and wider application and one that I should highlight which has some bearing on the enterprise fund at the moment is our discovery some years ago of liquid crystals which now brings in very large royalties approaching, I think, at the present time—probably the peak—approximately £15 million flowing in from that, so naturally we are delighted that it had that wider application. We never rule it out. I was not quite sure whether there was a note of scepticism when you referred to the framework document as our "flexible friend", but I should just draw your attention to a paragraph which I think emphasises the flexible friendship nature of it as well as anything, which is paragraph 7.1. That reads as follows, and I quote it to the Committee: "While its primary aim is to support MoD the DRA may seek work on commercial terms from other government departments, other governments and industry within the framework of its corporate and business plans as approved by the Secretary of State", so I think that the clear answer to your question is that if the Defence Research Agency, bearing in mind its primary responsibility and remit, feels that it would like to use the enterprise fund in some thoughtful way that had relevance to both military and civil technologies, yes, it is free to do so provided it does not in any way derogate from the main focus of the Defence Research Agency.

(*Ms Seammen*) My Lord Chairman, I wonder whether I may just add to that. I think that the two questions are very much connected because one is a question of the usage of physical capacity and the other is making the best use of the intellectual capacity, the people in the Defence Research Agency. On the question of physical capacity I think our experience is that Treasury rules have not been a barrier. As Peter Ewins was saying, it is very much a question of the Defence Research Agency being able to make a commercial judgment about the pricing of these facilities and how they might bring in revenue through wider use. We have not found the Treasury in any way inflexible on that although of course they would want to look at it very much in the wider context of whether there was unfair competition against other United Kingdom firms. When it comes to the use of the enterprise fund I think that it is a question of making use, the best use, of the expertise and experience that there is among the Defence Research Agency staff. It is a question of priorities. Of course the defence priority must come first, but if by using some of its commercial income, the DRA in this kind of area builds up the overall expertise, critical mass and effectiveness of the DRA which we need to underpin our defence purposes, then we should be happy to see that.

833. Thank you very much for those answers. May I just follow that up, my Lord Chairman. Is there at this stage any limitation on the size of an enterprise fund? Presumably at some stage the Ministry of Defence must feel that they should benefit rather than spinoff and therefore as it were the national interest should benefit?

(*Ms Seammen*) That is quite true.

834. Do you know where to draw that line at this stage?

(*Ms Seammen*) I think that we should want to draw it in discussion with the Defence Research Agency. We have not taken a firm view, but I think that the sort of sums that they have been talking about and the sort of purposes to which they would want to apply these sums we on first sight do not have a great difficulty with.

835. And nor do the Treasury?

(*Ms Seammen*) I have not discussed it specifically with the Treasury. Of course, they would take a view about the overall resources and the overall return that the Defence Research Agency was making, but I am certain they would, as they have taken a responsive and I think very responsible attitude to the development of the Defence Research Agency as an agency.

836. And a flexible view?

(*Ms Seammen*) That too!

Baroness Platt of Writtle

837. My Lord Chairman, perhaps I may follow up the last two questions, and I have two more. The first is on the question of the framework document. The minister was talking about paragraph 7.1 and I have always had marked on mine down towards the bottom of that page "co-operation with industry". One has at the same time the White Paper from the Office of Science and Technology on Realising our Potential with the emphasis on wealth creation. It did seem to me that it would be a sensible thing to put into that co-operation with industry—obviously the first duty of the Defence Research Agency must be to the MoD and defence of the realm, but after that to have a duty towards wealth creation, which I think does happen in America?

(*Mr Aitken*) Here we are entering the realm of discussion about whether the Defence Research Agency should move in the direction of what used to be called DARPA and is now called ARPA and we think that these are really two distinct and different roles. I myself had useful discussions with the Chief Executive of the Defence Research Agency as soon as President Clinton made his speech at Westinghouse early last year. I was searching whether we should look at whether we should be moving in the same direction and the overall conclusion was, no, we should not, because these are really two quite different entities, the Defence Research Agency and DARPA or now ARPA. It is not for me to comment in any detail on the American Government policy but they have long had a view that that particular agency is there to fund industry and to help industry. Ours has had much smaller resources and our focus is far narrower: it is on battle-winning technologies. If we were to start to change the Defence Research Agency to being the Defence and Civil Research Agency and other government departments wished to fund it in

[Baroness Platt of Writtle *contd.*]

that way that would be a new proposition and it is perfectly reasonable to argue that it would be in the wider government view a tenable proposition, but we are here for the defence of the realm. We are very pleased for spinoffs to occur. We are trying all sorts of ways to involve industry, the Pathfinder programme and others, but at the end of the day the old saying, stick to your last, and especially if your resources are limited, is what we feel is the right and proper way to go.

838. I was not really meaning funding private industry. What I was meaning was that if there was that duty then the matter of spinoff to private industry and to wealth creation would be higher up in people's minds as a priority. I have been in the position of having statutory duties as chairman of the Equal Opportunities Commission, and it does make a difference if it is part of your statutory duty because as a consequence you view things in a different light, not necessarily on the question of funding but to make sure that these things are known and that the research is angled perhaps in different ways.

(*Mr Aitken*) I should not quarrel with you too strongly. I am emphasising that our formal position is that defence funds are for defence purposes, but in actual practical informal terms, and I will ask my colleagues to comment, I think that everyone in the modern Defence Research Agency is proud of the fact that R&D funds have been of considerable benefit to industry and the dialogue with industry is the there and real.

(*Mr Sutcliffe*) My Lord Chairman, I think that whether it is a duty upon the Defence Research Agency or not is one question, but certainly we have recognised in the White Paper, Realising our Potential, that there is a responsibility on the Defence Research Agency after discharging its primary responsibility to the Ministry of Defence to make as much use as it possibly can of the spinoff of its technology into the civil sector. Historically it has done that. There are many examples, very successful examples, of the technology transfer. The Minister a few moments ago mentioned some of them. One could include thermal imagers and the application there into firemen's helmets, for example, for rescue operations; carbon fibre composites developed for military aerospace purposes, which have found a very wide range of applications in civil aerospace; and such wide extremes as racing cars and tennis racquets, and there are many others. The Defence Research Agency itself has set internally its own targets for spinoff. We are monitoring the extent of that spinoff as part of our responsibilities which we accepted under the White Paper. Therefore, while it may not be a formal duty upon them I believe that all the mechanisms are in place to encourage, to stimulate and to monitor it.

Chairman

839. Do you feel therefore that you have fulfilled the recommendation of Sir Peter Levene and Professor William Stewart, and I refer here to question number 13 on our list where we quote the recommendation that "the DRA should aim and be allowed by MoD to become very much more involved with civil markets than is presently envisaged"? Do you feel that that has therefore been taken up or do you feel that the situation was all right when that was written and therefore there is nothing that needs to be done?

(*Mr Aitken*) My Lord Chairman, if I may just pick up the words "aim and be allowed" I should say, yes, we are aiming and yes, we are allowed to become more involved with the civil markets. The real barrier here is one of resources. There is no getting away from or escaping from the fact that defence budgets are at best stable and probably continue to decline. We certainly wish to grow at the Defence Research Agency our non-Ministry of Defence business in the best way possible, provided that it does not derogate from our fundamental responsibility—and there are quite a few programmes that we mentioned—and we like such involvement because among other things it maximises our royalty incomes. As the figure that I gave you of the royalties from liquid crystal shows, this can be very beneficial.

840. We have had the benefit of evidence from Professor Stewart from the Office of Science and Technology and from others. Do you feel that there are further mechanisms to be put in place to fulfil what you have just described as a desirable objective and are there further linkages that might be helpful to the Office of Science and Technology or the higher education sector? Are there any further measures that you would like to see us recommend in order to help you to do what you have described?

(*Mr Aitken*) I certainly think that good communications in discussion with the Office of Science and Technology are important and, indeed, coming back to the question relating to DARPA and ARPA, soon after President Clinton's speech I did hold a meeting with the Parliamentary Under-Secretary, Mr Davis, at the Office of Science and Technology, and we discussed the various programmes in place like Pathfinder and so on which were likely to help in this area, but I cannot think of any new mechanism which would be particularly helpful provided the thought is there and there is a reasonable amount of will there.

(*Mr Sutcliffe*) My Lord Chairman, we have in fact over the last 12 months put in place a number of mechanisms which will encourage the transfer of information from the defence sector into the civil sector. The Pathfinder programme, on which I think John Chisholm, the chief executive of the Defence Research Agency, briefed you when he appeared before you, was originally conceived primarily as a defence industry forum and primarily it still is. Although at the Pathfinder presentations last November there was a small representation from civil industry, quite importantly the Department of Trade and Industry was also present so that they could see what technology was being sought or what technology was available and could communicate then with their contacts within the civil sector. We have separately held briefings for the civil departments and the research councils on the technology which is available from the Defence Research Agency. We are arranging separate briefings for industry. We have one in fact for the defence industry next week and we are planning one for the civil industry as well. Although these

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mechanisms are informal the key is that they provide that communication mechanism to let the outside world know what is available inside the Defence Research Agency.

841. Do you think that the new research councils or, indeed, the old research councils that still exist are fully aware of the facilities that you have to offer and the opportunities that you could afford to link with the science programmes?

(*Mr Sutcliffe*) My Lord Chairman, they certainly are aware. Whether they are as aware as they could be I think is a matter for debate. They did appreciate I know the opportunity to hear the briefing presented last December which exposed those areas of the research programme that they had indicated would be of particular interest to the civil sector. I think that over the last two years particularly we have improved our communications with the research councils although we have always had good communications through a particular mechanism called the joint grant scheme which has been running now for many years. This is a mechanism whereby the Ministry of Defence on the one part and the research councils on the other will jointly fund up to a 50-50 share of research in universities. The proposals come initially to the research councils and are sifted in terms of their quality and passed to the Ministry of Defence and we look at them from our particular viewpoint of potential ultimate relevance to defence and we will then agree a joint programme. In that sense therefore there has always been very good communication, but in the general sense I think that it has improved and I am sure that it could be improved even further.

(*Mr Aitken*) My Lord Chairman, if I may just come back to Lady Platt's points about the section of the Framework Document on communication with industry I should not like to leave the impression that we are stuck in one particular mind set here. We will formally revise this document in four years' time. I think that I am right in saying that we are likely to have an interim look at it again in about a year's time. We will certainly consider whether any stronger wording could be put in this part of the document in the light of your Lordships' Committee's recommendations because we know that you have focused on this. Although we think that the signal was clear and the document is flexible enough it has been useful to have the views which have been expressed in earlier sessions here and if there is some fine tuning or improved wording that your Lordships recommend we will certainly look at that in the light of our possible revisions.

(*Ms Seammen*) My Lord Chairman, if I may I should like to add one point. I think that the role of the Defence Research Agency Council is very important in this whole question because it has on it importantly two outsiders from the civil sector, two members from the civil sector, Dr Rudge from British Telecom and Mr Henry of Brown and Root. Therefore, they do bring very much the outside industry and in this case the civil industry perspective to the overall oversight of the Defence Research Agency.

Lord Dainton

842. My Lord Chairman, I wonder whether I might raise one point which arises out of the primacy of the role of the Defence Research Agency in advising the Ministry of Defence, and particularly of course it still has the role of advising on procurement, that is right, I think, is it not?

(*Mr Aitken*) Yes.

843. Does this create any difficulties as it might seem to the outsider in the dealings which then the Defence Research Agency has to have with private industry either as competitor or indeed as a customer or a contractor?

(*Mr Aitken*) My Lord Chairman, if I have understood Lord Dainton's question correctly, I think that there are some concerns here that if the Defence Research Agency is allowed to compete in certain areas or align with certain companies as subcontractor this could create tensions if they were going to be working with these downstream. I think that there is a concern here which you are right to highlight. I do not have any quick answers for this except to say that we are monitoring; we do not think that this is a real problem right now but I can see that it conceivably could be and so we are watching that possibility quite closely.

844. Does it impede spinoff in any way?

(*Mr Aitken*) No, I have no examples of its impeding spinoff.

Baroness Hilton of Eggardon] We have heard evidence from industry that they feel inhibited to some extent so clearly that is so, is it not? They felt that the previous ability to talk freely with the Defence Research Agency was inhibited, particularly given the fact that the Defence Research Agency is now in the position in some sense of adjudicating and advising.

Chairman

845. I think that it would be fair to say, would it not, that this is a perception that we have recognised and it has been very difficult to have instances quoted back to us even when we have asked for them.

(*Mr Ewins*) My Lord Chairman, perhaps I could just add a little there and put it into perspective for you. I am sure that when the Defence Research Agency was first created, before it became a trading fund, under its previous chief executive it was believed both inside the Defence Research Agency and by industry that the Defence Research Agency was being created to indulge in the white heat of competition with industry. Indeed, my recollection of being in the Defence Research Agency at the time is that we said, "goody, now we will go get them". That was never tenable for either side and I think that it was very quickly recognised. As the Defence Research Agency has settled down I think that there is now a much clearer understanding, indeed, a clear understanding, between the Defence Research Agency and industry, but it does take time for that previous perception to filter down to the people who do the collaboration between industry and the Defence Research Agency. I think that whereas it is quite clear, for example, between the Chief Executive and the MDs of industry, there is still a lingering

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question at the lower levels where business is done, "Are we to divulge everything to you, are we in competition, is there a standoff?". I should simply say that as each month goes by the new view filters lower down into both organisations and that relationship gets better and better. I believe therefore that it is just a transient effect and a hangover from the past and I really do not believe that there is any future substance or need for future concern in that area.

Baroness Hilton of Eggardon

846. But your concerns are Ministry of Defence concerns and industry may have its concerns?

(*Mr Ewins*) I think they may, but if I may say so, my Lord Chairman, I think that all the evidence that I can muster is that industry itself feels more comfortable. I think it is because the Defence Research Agency has quite properly taken a line which is that they will not deliberately go out and compete in areas where industry has been traditionally strong and competent. There is a complementary relationship and as long as the Defence Research Agency continues to recognise that I think that all will be well.

Lord Dainton

847. It is one of those areas unfortunately where it is going to be very difficult to get hard evidence not least because those who are holding back from entering into relationships are doing so for reasons that they do not want to disclose to competitors or others so it is very difficult to be clear about this. I think one has got to wait several years to make a proper assessment of it.

(*Mr Ewins*) I should be very encouraged, for example, by the progress that Pathfinder has made where industry is being asked to open up its ideas to the Defence Research Agency. I should be very encouraged by the strategic alignment meetings that the Chief Executive has with industry where both sides are prepared to open up about what they are doing. I should say that although both activities are more formal than they used to be not only are they better than they were two or three years ago but they are probably better than they were in the last days of the research establishments before the Defence Research Agency was created.

Baroness Hilton of Eggardon

848. May I pursue the question of the overall architecture of the Defence Research Agency and the Ministry of Defence and the appropriate range of technologies that should be within the Defence Research Agency and how that is determined. As the DRA and the MoD become to some extent separate entities the free flow of staff which used to go on between the MoD and the DRA will diminish particularly if the Defence Research Agency has separate pay and conditions for its staff, so it is the role of the Ministry of Defence as intelligent customer and the overall shape and architecture of the necessary expertise within the Defence Research Agency which concerns me. I understand, which puzzles me, that you let contracts to other firms for advice on defence matters but without going through the Defence Research Agency. I am not at all clear how you make those decisions about which expertises should lie with the Defence Research Agency and which should go elsewhere, how you decide what is included in the Defence Research Agency and their range of competencies and what other competencies perhaps they should have. There are new developments in science on the fringes. It might be appropriate for the Defence Research Agency to start addressing them. How do you know about those new developments and, on the opposite point, how do you decide that perhaps some university department is better equipped or part of industry is better equipped to deal with things than those within the Defence Research Agency. That whole question of the architecture and future strategy is my area of concern. I am not quite sure who should reply to that, my Lord Chairman.

(*Mr Aitken*) My Lord Chairman, I will start and then hand over to Peter Ewins for reasons that I will explain. First of all I think that the exchange or interchange of staff does happen and will continue to happen. Indeed, Peter Ewins is almost a living example of that.

849. I am encouraged by that!

(*Mr Aitken*) We can go on drawing on Mr Ewins in that way because the top level customer in the Ministry of Defence is the Deputy Chief Scientific Adviser. I hope that your Lordships will be convinced that he is a reasonably intelligent one after the discussions this morning! I actually myself will listen to his answer with some interest because how you judge whether you should give a piece of research to a university department which has a primacy in this field or whether you should keep it in house I think and believe from my discussions with his predecessor and the two chief scientific advisers with whom I have worked since being minister that this is a scientific judgment. They go where the best brains are. But let me turn this over to Mr Ewins, my Lord Chairman.

(*Mr Ewins*) My Lord Chairman, may I just deal with the interchange of staff first and then come to the other matter. I think that it was going to be a cause for concern. Again when the Defence Research Agency first was created there was a tendency for the shutters to come down on both the Ministry of Defence and the Defence Research Agency side on the staff interchange. Both groups began to look inwards about how best to fulfil their own remits and hang on to their best staff and it jammed up a bit. I think that that has matured and the interchange of staff last year was much higher than it had been the previous two years and back to something like the old relationship even though the size of MoD had shrunk to some extent. Two things are relevant, I think. First of all, the Ministry of Defence had identified a number of key posts, upwards of 20 or 30, which it believed would be best filled by people with experience from the Defence Research Agency. That is now a formal relationship in the sense that when those posts need to be filled the Defence Research Agency is approached and if necessary pressure is put on to make it happen. But I think that the other important thing is from the Defence Research

[Baroness Hilton of Eggardon *contd.*]

Agency side. Dare I put it this way, that there is an increasing realisation that as a primary supplier to the Ministry of Defence it is very much in their interest to have staff of theirs who will go out and back sitting in parts of the organisation where they gain great visibility of MoD's future programme, its strategy and so on, so I should say that that has opened up. It could still work better, but it is now working I think reasonably well. You might like to know that I also have the role of head of profession for engineers and scientists in the Ministry of Defence and I meet regularly and fairly frequently with the Chief Executive to discuss staff moves in both directions. Perhaps I may now move on to the business about maintaining the technology area. I think one has to start on the basis that the primary purpose of the Defence Research Agency is to maintain a science and technology base of adequate breadth and depth from which it can deliver a range of services to the Ministry of Defence. Those services may be right at the beginning of the cycle in helping it to analyse the military threat that it faces and it goes on advising on operational requirements, procurement, and at the other end of the cycle, to advising the Services on the way they operate with the equipment they have got, very often in quite different environments from the ones for which the equipment was procured. The key therefore is to maintain the science and technology base for the Ministry of Defence. In principle one has to say that it is consistent with the concept of DRA being in a close relationship with MoD that you create that base primarily within the Defence Research Agency. But what the Defence Research Agency has to do, and I think that it does it adequately well at least, is to say, we are not expert in everything but we do know how to pull in the experts so that they will do some of the research for us, but it is us that will maintain the knowledge base that that research helps to maintain from which this advice is given to the Ministry of Defence. I think that there is not a difficulty about going out and identifying the people with the best ideas, with the best brains, with the best research teams, but it is true to say that it would be usually through the Defence Research Agency that it is done. The difficulty comes with the last point that you raised, which is, how do we look at our crystal ball and say what are the technologies of tomorrow which MoD is likely to need and on which we are not working. Now I can give you the formal answer, which is that we carry out technology audits and try and do it that way, but in fact nobody has been able to do that successfully. We can do it by a number of other means. We can look world wide at emerging science at quite fundamental levels. That is both a responsibility of the Defence Research Agency and of the central scientific staff, which I lead. You can go further and say, what is it that we know from intelligence information that our potential aggressors are themselves doing and from that you can build up a picture, but none of us has this ability to pick tomorrow's winners, otherwise I think that I should not be sitting here, I should be elsewhere!

Lord Dainton

850. My Lord Chairman, may I come in at this point because there used to be a maxim when I was involved in these things that you cannot fish from the sea of knowledge unless you are in fact contributing something yourself. This is where I come back to an earlier point about enterprise programmes and looking at the frontiers you have been so eloquent about. I think that this is a genuine problem. Of course, with the Defence Research Agency now being responsible for its own funds as a package how do you find that money which you regard as being at the margin but nevertheless a very important investment for the future in supporting exactly these areas? That is really what concerns quite a number of our witnesses, I think.

(*Mr Ewins*) My Lord Chairman, there are two sorts of money that we should think about here. There is the strategic research programme which I look after which is MoD in conjunction with the Defence Research Agency saying where we think tomorrow's priorities lie and please can you put some good ideas up in those areas. The converse is that the Defence Research Agency may well have ideas which do not really fall into that portfolio, but let us remember that they can always propose to us the content that they would prefer to see in the strategic research programme. More particularly however the enterprise fund is used to do just that. I should mention that in disbursing the funds that the enterprise fund creates—

851. Disbursing rather than disbursing?

(*Mr Ewins*) Absolutely, exactly so. There are three areas where it goes. First of all, a very important issue, it is necessary for some of that money to be ploughed back into the means which "incentivise" the staff to come forward with good ideas. Up until the creation of the trading fund that was denied to the Defence Research Agency, but now both staff as individuals but more particularly research teams benefit by the ploughing back of money. Let me give you one example. In the liquid crystal work that has generated so much of our income we have been able to increase the laboratory facilities at Malvern where that work is done and to finance a number of additional research scientists in the field of liquid crystal display so they feel that there has been a direct benefit, and one or two of them have benefitted personally by money going back into their own pockets because of their own inventions. That is very important, that is, the incentive part. The second part of course is that it can actually be used in the very activity itself. In the same example, part of the enterprise fund money is wrapped up in a contractual relationship with Japanese companies which says that the Defence Research Agency will expand its research programme and make that information available to the Japanese companies. So what do we get out of it, because I realise that is Japan and that is emotive? The answer is that we have been the recipients of some of the earliest devices of display technology that are already in RAF demonstrator aircraft and in respect of which we estimate we are about five years in advance of any other countries in the world, and that is quite important too.

852. My Lord Chairman, I have a rather simple question here. Are you yet in a position to be able to say as compared with the old arrangements whether the amount of money that is now available as a proportion of the total for this kind of almost blue

[Lord Dainton *contd.*]

sky "but you know exactly what I mean" research is the same now as it was before or is it greater or less?

(*Mr Ewins*) It must be greater in the sense that previously any money generated by industrial property exploitation went back to the Treasury. That is now retained by the Defence Research Agency for exploitation in various ways of course in agreement with the Ministry of Defence in terms of its needs.

853. That is your enterprise fund?

(*Mr Ewins*) Yes, and that fund this year I think, or in the last financial year, has a revenue of about £15 million to £18 million so it is a not insignificant sum of money.

854. I do not want to put words into your mouth, but are you then really saying that the incentive to develop that side which for future defence is very, very highly speculative now is automatically self-accelerating in the sense that if people do well, they earn money and they can put more money into this?

(*Mr Ewins*) Yes, I think that perhaps "automatically self-accelerating" is a step too far to me, but there is a much greater incentive on both individuals and us to do it. I think that the evidence is that it is working. I do not think that it is coincidence that the amount of money generated has gone up. It is partly the stage we are at with the programme but partly because individual scientists and their teams now feel a genuine incentive to go out and do well in that area of exploitation.

(*Mr Aitken*) My Lord Chairman, perhaps I may just add one dimension to Mr Ewins' answer. I talked earlier about flexibility and some ministerial involvement. I will give you an example. I will be somewhat circumspect; you will see why as I do so. Some time ago a former chief scientific adviser came to see me to say that a nation which was not necessarily always going to be friendly or responsible seemed to be developing a certain technology which could be troublesome, to put it mildly, and he wanted to get some extra intelligence on this, to look at it more closely, to get some extra research done into ways we had to combat it and so on. That was if you like a ministerial decision to go ahead on that which did not need somebody in the Defence Research Agency to start penny pinching to find it. When we need to we can look deeper and wider quickly at a particular technology in which we are interested.

Chairman

855. Ms Seammen, you wish to come in?

(*Ms Seammen*) My Lord Chairman, I want to clarify in the light of what Peter Ewins was saying about the sums available for the enterprise fund this year, that I think he will agree that this was a rather large and unexpected access of funds from IPR and the sort of level of the expenditure from the fund that we are thinking about over the medium term in a steady state would be a good deal lower than that.

(*Mr Ewins*) Indeed, my Lord Chairman.

Lord Craig of Radley

856. So that you do have a figure in mind then?

(*Ms Seammen*) Lower than the one that he was talking about!

Baroness Hilton of Eggardon] You mean the Treasury has a figure in mind!

Baroness Platt of Writtle

857. My Lord Chairman, we are ranging far and wide this morning, but I was coming back to question number five, following up what Lady Hilton was asking. I can quite see that you cannot second-guess always where new technologies are going to develop, but I wonder whether in order to keep the capabilities it would help if you had a critical list of technologies, as they do in the United States of America apparently, that you would see as vital?

(*Mr Sutcliffe*) My Lord Chairman, we have a form of technology list although we prefer to think of critical or key technologies as being the outcome of our programme formulation process rather than the input to it. At the present time what we do is to look at the long-term military requirements, the military research objectives, and those are then translated into technical research objectives by the Defence Research Agency on our behalf. On that basis they formulate a research programme. Quite separately I in my capacity as scrutineer of the research programme look at what is being put forward, compare it with the military operational requirements. We look at what is going on in the universities and in industry and internationally through our bilateral and multilateral contacts with our allies overseas. On that basis we do put together a list of the technical areas that we believe need to be sustained and enhanced in the longer term within the Defence Research Agency. That list obviously is made available to the Defence Research Agency and, indeed, it is now in a slightly modified form made available publicly through white papers. We do then have a list. I think that the danger—and I hesitate to comment on one of our allies' strategies—of producing very long lists of technologies is that if you are not careful they appear to be circumscribed and there is then a danger that you will actually drop key areas simply because they are not on the list whereas going for a rather more general list though none the less focused on areas of activity rather than specific technologies it does allow that freedom and initiative of the individual scientists to pursue them.

858. Yes, that sounds an interesting way of doing it. I understand again going out to the United States of America that they have a duty to watch that firms that are critical on defence procurement remain in business, particularly where you might have a unique firm that is capable of providing a certain important piece of equipment or whatever it is. Is there anything like that in the Ministry of Defence?

(*Mr Aitken*) There is no critical firms list.

859. I was just going on to refer to what Mr Sutcliffe said, that this was available to private industry and with the cutbacks that obviously there must be in terms of Ministry of Defence procurement because of the changed situation after the end of the Cold War are you at all anxious about certain firms that might be producing important pieces of equipment which may now find themselves going out of business and therefore making it difficult to procure that in time of war within this country?

[Baroness Platt of Writtle *contd.*]

(*Mr Sutcliffe*) We do monitor the capability of British industry. That is done primarily through our Procurement Executive rather than through the research side, but it is done. In a sense it is clear that there are some areas where the nature of the industry is such that it has no civil market and where the Ministry of Defence has clearly supported it: nuclear weapons is a very clear example. So far however we have not had cause to have to intervene in the market place. The capabilities that are important to us have remained within UK industry.

(*Mr Aitken*) Perhaps I may just add to that, my Lord Chairman. We have looked hard and deep at the very question that you ask. The formal answer which I think that I have already given in answers to parliamentary questions but I am glad to put on the record now is that although we are much aware of the considerable loss of capacity in our defence industries we are not yet aware of any loss of vital capability.

Baroness Platt of Writtle] That was what I meant.

Lord Renwick

860. If I may return and follow up Mr Sutcliffe's reference to external relationships, my Lord Chairman, does the fact that the Defence Research Agency is a trading fund have any—and we have had evidence that you operate on a government to government basis in your external relationships which brings us of course to tie it in with the fact that some people are suggesting that the next step after a trading fund is total privatisation. Can Mr Sutcliffe discuss that situation?

(*Mr Aitken*) I think, my Lord Chairman, that is really a policy question and probably should best be addressed to me, if I may intervene.

861. I apologise—the subject was brought up by Mr Sutcliffe.

(*Mr Aitken*) I am very glad for my colleagues to join in, my Lord Chairman. We have no plans for privatisation. We are automatically required now when we look at the future of almost any part of government to run through a list of prior options—should we privatise, should we go to a government-owned contractor-operated (GOCO) situation—and I should say that looking at the future of the Defence Research Agency, well, formally, yes, we might look at the privatisation option as we are required to do on the list of prior options, but there are others and in my view much more likely options such as continuing the status quo as a defence agency and trading fund or going to GOCO status or possible further joint ventures with industry developing through the dual use technology centre concept. I welcome the chance to flag up one particular reason why if one was to start looking at the privatisation option one should be cautious, which is that the Defence Research Agency does share with our allies a certain amount of secret research. I think that some of our allies would be anxious if they thought that that secret area of research was moving into the privatised private sector as opposed to being under the control of government, so there would be good reasons for being particularly cautious about the privatisation option, but I emphasise that there are no plans for privatisation.

(*Mr Ewins*) My Lord Chairman, may I just add that as far as international collaboration is concerned particularly at the research level as all nations' defence budgets come under severe pressure then the leverage that you get from international collaboration becomes increasingly more important to you. It is also bound up with subsequent collaborative procurement, of course. There are however many nations, commonwealth nations, United States, within Europe, where we have some very strong, important collaborative activities and it is worth noting there that the policy and the infrastructure which maintains that collaboration is held firmly inside the main body of the Ministry of Defence. What the Defence Research Agency does is to prosecute the actual collaborative research under those agreements, and that is very important. At least one nation would have said to us: if you put the Defence Research Agency too much further away from MoD, then we will begin to rein in the amount of information that we are prepared to release under collaboration. I think therefore we have a very good arrangement at the moment with the Defence Research Agency in its position and with the Ministry of Defence retaining its responsibility for the policy and the structure of collaboration, but it is a fairly delicate relationship which we ought to be careful we do not disturb.

Lord Dainton

862. May I ask, my Lord Chairman, and one is thinking presumably of NATO, nuclear, and that kind of thing, whether that in any way inhibits the ability of the Defence Research Agency to enter into discussions with British industry at times where British industry could profit? You will hold the whip hand, I imagine, in this?

(*Mr Aitken*) In general terms, my Lord Chairman, I should say that Britain's defence industries are extremely responsible and show themselves to be totally trustworthy subject to the usual clearances in keeping such secrets.

(*Mr Ewins*) My Lord Chairman, I hesitate to mention any particular nation, but one should be very aware that, particularly in the case of the United States, there are certain regulations within the collaborative arrangements which prevent research being carried out in UK industry which might subsequently be in competition with United States firms.

863. This is why I raise the question.

(*Mr Ewins*) So it is very important that the collaboration is done at government to government level, and in that regard there is a distinction between the position of MoD centrally and the position of the DRA even though the DRA is wholly owned and under the umbrella of the Ministry of Defence, and we are careful to take notice of that distinction.

864. But then the Ministry of Defence is in the position of being a customer of the Defence Research Agency within certain limits which it has agreed to internationally?

(*Mr Ewins*) It is not so much the customer relationship; it is that in prosecuting the collaborative arrangement there is no real bar on

[Lord Dainton *contd.*]

what the Defence Research Agency does but there is a feeling that the Ministry of Defence must retain control of the agreement and its infrastructure. In practice the research scientists in the Defence Research Agency are as involved in international collaboration as they ever were and that is very important.

Lord Craig of Radley

865. Perhaps I may ask about one very short point, my Lord Chairman. Am I right in assuming that the Ministry of Defence has seen no adverse change in their international collaborative arrangement as a result of the move from the old establishment to the new Defence Research Agency trading fund?

(*Mr Aitken*) Yes, my Lord Chairman, that is absolutely correct.

Lord Trefgarne

866. My Lord Chairman, I wonder whether I may draw on my own now very out of date experience and ask you how you find that the Defence Research Agency now works in a context where you would be considering an important procurement programme, no doubt with some difficult technology, and you need to decide for yourself in authorising that programme whether it will work, I can recall turning to the CSA of the day and saying, "Dick, will it work?", and a shuffling of feet. That is a key question that you have to ask if you are going to authorise large sums of money on a procurement programme. How are you served in that way?

(*Mr Aitken*) Well, your experience far from being out of date is as relevant and modern as ever because we do—that is exactly the kind of question that a minister must ask, is it going to work, and particularly when there are sometimes voices being raised from competitors or whatever or may be, from rivals, saying, "Oh, I'd be very careful whether it will work", so you hear these voices. Now the biggest single project for which we see a bright and good future and we are very proud of it is today's Eurofighter. Eurofighter is still at the development phase and our priority with Eurofighter is to make sure that we have a world class fighter aircraft in which when our pilots go up in combat and have to engage in combat and hostile action they will go into combat and win, and we have to be sure that it is (in words that Lord Craig will know much more about than I do) as mobile as possible, can turn and manoeuvre in all sorts of ways. There have to be expert questions asked about that. You cannot always just simply rely on industry's evaluation; you have to have it checked by your best experts. Where do we go? We go to the Defence Research Agency and we ask them aeronautical questions of that nature. The Defence Research Agency of course has now swept into itself the world famous Royal Aeronautical Establishment at Farnborough which is used to dealing with these sorts of questions, so, yes, we do need that expertise, ministers do ask those questions still and we go to the best source of expertise, which is the Defence Research Agency, and we are doing that today.

867. Lord Craig of course, as I, and it was long ago now, remember that the staff requirement was a very demanding one. The manufacturers of course are sure that they will meet all the requirements that we put on them, but will they? Somebody has to be there to give us a balanced technical judgment. Do you have that in the Defence Research Agency?

(*Mr Aitken*) Yes, I am sure that we do. The Defence Research Agency is a centre of national and scientific excellence and they are the best people to turn to. They have huge strength in addition to all their world renowned reputation and quality. They are totally objective, they have no links with other nations or potential rivals.

868. I am of course going back to the AEW Nimrod—I apologise—and Lord Craig will remember that as clearly as I do. That programme had an original dawn of life at Malvern, in fact, at least, the radar system did, and so when we came to the moment where the problems were beginning to overwhelm us we could only turn to Malvern, and Malvern were the people who invented it, so we were wondering—at least, I was, and I dare say that Lord Craig was too—who else we could ask, and there was not anyone else.

(*Mr Aitken*) Of course, on the whole in my ministerial experience the who will guard the guards themselves question has not come up yet because basically we have had manufacturing industries' products or plans or projects to look at. But I think that the Defence Research Agency is big enough and capable of turning to this or that outside expert for further double checking and I think still is the one guardian of such quality and such excellence and such brainpower that it can guard itself. There are scientific cells very often, I am sure, that enjoy challenging one another's wisdom. Sometimes that is the nature of scientific debate.

Baroness Platt of Writtle

869. What will happen now that the RAE is going over to materials? Where will be the centre of aeronautical research and the kind of expertise that you are talking about?

(*Mr Ewins*) My Lord Chairman, I think that that is not quite right, if I may say so. There is the dual use technology centre which is at Farnborough and brings in aeronautical structual materials research, but the Defence Research Agency remains at Farnborough with its work on aerodynamics, propulsion, etcetera.

870. Oh, it does?

(*Mr Ewins*) Oh, yes, absolutely.

871. And is it going to continue to be called the RAE or not?

(*Mr Ewins*) No, the Defence Research Agency did away with the four establishment titles and created a number of what we call business sectors. One of those business sectors in the Defence Research Agency is called Aircraft Sector and it contains the work on airworthiness, propulsion, structures, aerodynamics. What we have pulled out to create the dual use technology centre is all the structural materials work that goes on for land, sea and air across all the sites in

[Baroness Platt of Writtle *contd.*]

the Defence Research Agency and pool them together in a new dual use technology centre.

Baroness Hilton of Eggardon

872. May I go back to the question of scientific staff within the Ministry of Defence, my Lord Chairman. You said earlier that there were 20 or 30 posts that were filled by people with DRA backgrounds.

(*Mr Ewins*) Yes.

873. It seems to me that that is only a proportion of the scientists within the Ministry of Defence and I wondered what the size of the scientific community was within the Ministry of Defence and why they are not the people who are advising ministers on the viability or strategic value of particular projects rather than DRA people and what their role in that enormous scientific community is.

(*Mr Ewins*) My Lord Chairman, I understand that point, and it is one that I ought to have made. While the Defence Research Agency is the primary source of scientific and technical advice to the Ministry of Defence it is not the sole source. One of the purposes of the central scientific staff is to weigh the Defence Research Agency's view with if necessary other people's views and a view of its own. For example, some of my staff carry out routinely technical scrutinies as particular procurement projects go through their various stages of approval. Now very often they will call upon the DRA staff to do work for that. In that sense my staff are a customer of the Defence Research Agency. But they need not go to the Defence Research Agency and they do not always go to anybody else either. As far as the numbers of scientific staff are concerned in the central scientific staff there are about 100 people. There are perhaps the same number in various areas of Ministry of Defence like the operational requirements staff with the scientists that are co-located and there are other scientists, as I am sure you would recognise, in places like scientific and technical intelligence activities. I do not know the exact numbers, but my guess is that it would be 200 or 300 scientific staff in MoD centre.

874. So, to go back to my original question, how do you ensure that they are independent of the Defence Research Agency and where do you recruit them from and make sure that they do provide that creative tension what the Defence Research Agency is advising and what industry is advising?

(*Mr Ewins*) There is an anomaly there. If you want experts they come by their very nature from areas where they can be trained and they may bring some trappings of partiality with them. To be very flippant, as I once said to somebody, if you really want true independent advice ask my children because they know nothing about it at all. There is a conflict between expertness and independence.

875. Indeed.

(*Mr Ewins*) What I would say is that under the new arrangement first of all quite a lot of scientists make a substantial part of their career in MoD centrally without going into the DRA or elsewhere and increasingly I would suggest that it is open to the Ministry of Defence centrally to have staff seconded into it or to recruit scientific staff from industry, academic institutions, etcetera. Indeed, in some parts of the Ministry of Defence—and the Director General of Scientific Intelligence would be an example—they call in much the same numbers of staff from industry and academia as they call in from the Defence Research Agency, usually on a rotating secondment basis.

Chairman

876. Mr Sutcliffe, you want to come in?

(*Mr Sutcliffe*) Thank you, my Lord Chairman. I merely want to add that all experience would indicate that scientists who come into the Ministry of Defence headquarters from the Defence Research Agency go native very quickly and that their former colleagues in the Defence Research Agency are the worst complainers that they are being beastly to their former colleagues at the Defence Research Agency, so I do not think that we have had much of a problem historically and I should not expect it to arise in the future.

Baroness Hilton of Eggardon

877. There is a problem of overall view, is there not? Such as in the computer field where almost every computer adviser always has one brand so that you never really get an overall view of capabilities of different systems or different manufacturers' products. I should have thought that the same thing applied to other fields of technology?

(*Mr Ewins*) I think that it is certainly potentially a problem but I think that it crops up as a real problem fairly rarely and usually when it does it is because we are talking about a technology in which the number of experts in the country are very few, they all know one another and you cannot be sure of their independence. But I think it is rare in this day and age.

Lord Dainton

878. My Lord Chairman, arising from the impression that I have gained from today's discussion, indeed, my own discussions, most of our witnesses have in a sense reassured us that the situation has not deteriorated in the way that one might have thought, or some have thought, through these new arrangements. They have done so by advancing arguments which say, well, the situation is much the same as it was in terms of closeness of relationship and so on. I am now left unclear in my mind, and it would be very helpful if someone would state explicitly to us, what are the positive gains of the new arrangements.

(*Mr Aitken*) My Lord Chairman, I will have a quick go, which is to say that the Defence Research Agency is much better managed. It had the disciplines that a trading fund imposes and it realised that it had to become more businesslike in the management field. I do not think there was ever any question mark about the Defence Research Agency's scientific excellence, but in terms of its managerial side it is probably an old truism that the worst people to manage scientists perhaps are scientists. The managerial skill is something that needs to be strengthened. Specifically, Mr John Chisholm who

[Lord Dainton *contd.*]

came before you very early on, with his top team, including Mr Ewins, carried out a major rationalisation plan. The rationalisation plan shed something like 2,000 jobs and closed many sites. It had the rather remarkable achievement of not diminishing in any way either the quantity or the quality of the scientific output. That was I think a very good and impressive step forward. I dare say other colleagues who are closer to it could find other examples but from where I sat I immediately felt that here was an enterprise which was being visibly well and better managed yet without any diminution of the quality of its scientific excellence.

(*Mr Ewins*) My Lord Chairman, I think that the other point to note is that, to use modern caché words like responsiveness, there is no doubt in my view, and I think the customers of the Defence Research Agency confirm it in the various customer surveys that have been carried out, that the Defence Research Agency is perceived to be much more responsive. By that I mean that rather than seen to be a bunch of scientists doing the things that they enjoy and hoping it is what the customer really wants, they are now truly responding to the Ministry of Defence as a customer, and I think that that has hit home very hard. So the two gains that I would point to are efficiency, in which in crude terms the number of man hours of science delivered to the Ministry of Defence has not gone down while costs have probably reduced by—I hesitate to throw numbers at you—20 to 30 per cent or perhaps £100 million per annum and as perceived by the customer, increased responsiveness to their needs. Those are very big gains.

879. Oh, yes, there has to be a loss in terms of developing a short termism attitude which means that you are paying for the present by sacrificing the future.

(*Mr Ewins*) No, in my own view it is quite the contrary. I suspect that if anything it has gone the other way, that formalising the customer-supplier relationship, dare I say, has concentrated the customer's mind on the need for maintaining the future. Whereas I think I had seen a tendency to short termism when the Defence Research Agency had the money and the customer was either ignored or had little say in what he wanted, that has turned round and if anything the longer term is better protected than it was perhaps two or three years ago.

Chairman

880. Well now, Mr Ewins, you are the customer for the strategic research.

(*Mr Ewins*) Indeed so.

881. And that is therefore a customer relationship. It need not have been that. We asked Mr Chisholm whether he would have preferred the Rothschild surcharge basis, which would have left him greater latitude presumably and he would not have had to refer to his customer so frequently. He, you will know, did not favour such an arrangement—perhaps you are relieved to hear that. Would you like to comment first on whether you feel that this strategic research can probably be described as a customer relationship and whether you feel that the proportion of the budget which must be about 8 per cent is appropriate? You may decide that that last part is policy, in which case it must be referred to the minister.

(*Mr Ewins*) May I come back to that point, because I think that there are some interesting points about the 8 per cent, my Lord Chairman. First of all I certainly agree with the Chief Executive of the Defence Research Agency because I believe that the point that we would both make is that because the interests of the Ministry of Defence and of the Defence Research Agency are the same, they are shooting at the same set of objectives, it is not surprising to me that the Ministry of Defence's need for long-term strategic research is more or less the same as the Defence Research Agency would propose in looking at its own long-term future to meet MoD's needs. It is a kind of circular argument. Therefore, I feel very confident that the aims and objectives are the same and therefore the kinds of programmes that I would want done and they would want to do are very similar. But I think that to get to the bottom of that you need to understand—and I am sure that you do, my Lord Chairman, but forgive me if I rehearse it—how the strategic research portfolio is derived. Broadly speaking it is a circular process in which I and my staff have some ideas about changing priorities and we suggest to the Defence Research Agency where we would like greater emphasis, where we would like lesser emphasis. They then propose the sorts of work that they would like to do based on their own interests, their own knowledge and their own capabilities, and they put forward a programme of research which exceeds our capability to pay by something like 50 per cent. From this programme of propositions—a portfolio of proposals—by review we whittle that down to the size of programme that we can afford and want done. In whittling that down we bring in a series of external experts. Each area of research, which may contain 50 or more proposals, is scrutinised by my staff and independent people from academia both for its relevance and for its quality, and that is important. I think it is not surprising therefore that our interests are in common. If I may just pick up the 8 per cent point, I think the difficulty that I have with that is that the definition of strategic research is somewhat arbitrary. We use words like 15 years hence; we used to use words like, only a 50 per cent chance of coming to a successful fruition, in order to bring in the speculative research. We do not quite do it like that now. Indeed, some of the changes that we are likely to make over the next year or two as a result of the development of the agency and the development of the Ministry of Defence are that we will probably redefine strategic research to include the current strategic programme and much more of the so-called technology underpinning research. If you do that you bring that area of research to something of the order of 20, 25 per cent. I would use the word, corporately funded research rather than strategic, because what I have in mind here is research that is aimed at meeting the Ministry of Defence's long-term objectives for a full range of MoD customers, that is without prejudice to whether the customer will be the intelligence staff, the operational requirements staff, the operational services themselves or the

[Chairman *contd.*]

procurement executive. It goes back to my earlier point, if I may, my Lord Chairman, which is that the primary purpose of that research is to maintain the health of the science and technology base from which the services that the Defence Research Agency provides are provided most cost effectively to the Ministry of Defence.

882. Mr Chisholm I think very aptly described the strategic research as the oxygen of the future. I should like to ask the Minister what assurance he can give us, however you choose to define what might be strategic research, that this oxygen is going to continue to be given the priority that it deserves?

(*Mr Aitken*) My Lord Chairman, certainly this Government and this minister has no intention whatever of depriving the Defence Research Agency of this oxygen, to use Mr Chisholm's word. The strategic research programme is vital to the national interest. It must continue; what is the right level is obviously a matter for dialogue, but we have no plans to alter the present balance.

883. Bearing in mind of course that the balance has to reflect a declining budget.

(*Mr Aitken*) I think the point about declining budget is that we believe, I hope, in respect of spending on defence after the Options for Change programme and now a more recent look at administrative and support costs which is known as Front Line First, we very much hope that there will be stability in defence spending and that therefore would include stability for defence research spending.

Lord Trefgarne

884. May I ask finally another simple question, my Lord Chairman. Are you satisfied that when you call upon the Defence Research Agency to perform what I might call emergency research, and a particular difficulty emerges in connection with a particular threat which is current and operational, they are in a position to respond to that in a crisp and effective way?

(*Mr Aitken*) The short answer is definitely yes, and I would only add the obvious thought that the Defence Research Agency itself probably has that expertise in house, but if it needs to go to some top academic or industrial brain or centre of excellence to help solve the problem it does not hesitate to do that as well, as I know from one particular problem that has occurred in recent years. So, yes, and it may include bringing in some other outside expertise. If I may just go back to the previous question for a moment, my Lord Chairman, on the strategic research, I think that if resources are getting scarcer in some ways it is even more important to invest in the battle-winning technologies of the future so that is an additional reason that I am confident in my earlier reply to you that the notion of reducing the strategic research proportion is not being considered.

Chairman] Thank you for that assurance.

Lord Craig of Radley

885. If I may just pick up that point, my Lord Chairman, you will recall that it was government policy a few years ago to reduce the amount of R&D expenditure in the defence field in order to benefit non-military R&D expenditure nationally. From what you are saying do I take it that that policy has run its course, as it were, and you are no longer under any external pressures to a reduction in the percentage of your overall budget that you are allowed to spend on research?

(*Mr Aitken*) I am not aware of such pressures on the Defence Research Agency, and we have a core business to perform and a central responsibility, the defence of the realm, to look after in terms of researching on these battle-winning technologies. I think that any defence minister would oppose any effort to restrict and diminish that crucial effort.

Lord Craig of Radley] Well, we certainly made great efforts. We failed. I was just wondering where it had got to.

Lord Trefgarne

886. Defence R&D was capped, as I recall, the 1986 figure, on the grounds that this would release new resources for the civil defence world at a time when they claimed they were starved of experts, materials and so on.

(*Ms Seammen*) I believe that as it were the shadow of that policy remains, but because it was related to defence resources and R&D back in 1986 quite a lot has changed since then and it is not an effective constraint on our policies in relation to R&D now.

Lord Renwick

887. We have had evidence that activities within the Defence Research Agency were dependent on the cash obtained to perform those activities. A lot of the evidence that you have given this morning supports that and brings financial disciplines, Minister, as you said. I wondered whether you would like to comment on the difficulties always in defining the cost of a certain project or programme of research and the future value of it and whether Mr Ewins' central scientific staff operated under the same restrictions, if they can be called restrictions?

(*Mr Ewins*) I am not sure that I fully understand when you say, whether we operate under the same restrictions.

890. Within the Ministry of Defence rather than within the Defence Research Agency. We have had evidence to say that a programme of research went as far as the funding was available and no further.

(*Mr Ewins*) My Lord Chairman, it is certainly true in my own central scientific staff, clearly although we are not limited in a formal customer-supplier way with money changing hands, we are limited by the number of staff that we have and the resources that we can therefore apply more generally, so that really is the simple answer to that. I do not think that anything has changed in that regard. If you are asking a slightly different question which is, since the role of the central scientific staff is complementary to that of the Defence Research Agency staff, have we shifted the balance in some way which makes it more difficult for one party or the other, then I would say that the answer to that is no. The central scientific staff are themselves shrinking to some extent as everything else is, but not excessively so and the

[Lord Renwick *contd.*]

primary role of the central scientific staff, and I mentioned roles like audit, scrutiny, oversight, review, as well as doing our own independent advisory role, which is the prime function, are all being carried out as they were before adequately well. But I think that I have probably missed the point.

891. Yes, maybe I should not have brought in the central scientific staff. I should have concentrated on the Defence Research Agency and evidence that we have received that research only goes as far as the funding. Is that seen as a restraint on the Defence Research Agency's activities in any way?

(*Mr Ewins*) I am sure the Defence Research Agency would say that it must be a constraint! You have a bunch of very enthusiastic scientists who would love to do more and more and more. If you are asking another question, which is, does this pose a constraint which is either greater than it was before or one which is to the Ministry of Defence's disadvantage, I would say what I said earlier, quite the contrary. I think the discipline on the Defence Research Agency as supplier and, incidentally, the corresponding discipline on the Ministry of Defence as a customer (and we must not forget that that is equally important in the equation and that Ministry of Defence customers have rapidly learnt how to be professional customers) has ensured that we get more out of the research we do, it is better directed and more efficiently delivered.

(*Mr Aitken*) My Lord Chairman, may I make just one final point on this to Lord Renwick. I was referring earlier to the better management of the Defence Research Agency. We are currently engaged on this big exercise, defence cost study, which includes other scientific and research headquarters and areas within the defence environment, and we believe that those too can benefit from some of the better management skills and applications of things that the Defence Research Agency has done. Thus we hope this will release extra resources for research and development effort. Therefore, although resources will always be a restraint—the Defence Research Agency itself has a £600 million budget and we have other research organisations which have significant budgets—I think that by managing things like overheads and sites and so on better we will continue to deliver the right level of scientific research in defence.

Chairman] Minister, we have I think ranged widely this morning and detained you a long time. I think that we should do so no longer. Our thanks to you and your team for the very helpful way in which you have addressed the many issues that we have asked you to consider. May I say how enlightening we have found this whole enquiry. Many of us are not as expert as others and it has been a most interesting exercise. Thank you very much.

WRITTEN EVIDENCE

Memorandum from the Association of Independent Research and Technology Organisations (AIRTO)

1. THE DRA AND ITS RELATIONSHIP WITH THE MOD

1.1 *How independent of the MoD is the DRA?*

The MoD is the prime funding agency for the DRA and the two bodies regularly exchange staff. It is evident, therefore, that the DRA is heavily dependent on the MoD. On the assumption that the MoD set objectives and control strategies, this would further reduce the independence of the DRA.

1.2 *Does DRA's new status as a Trading Fund help or hinder its support to MoD as provider of best quality research?*

It is not clear that the trading fund status will lead to best quality research. The trading fund necessarily focuses on short-term issues associated with a return on investment. Military research is, by its nature, a long-term issue. The move to trading fund status in itself has not yet influenced the quality of research.

The three major sources of funding are available to the DRA (Strategic Research Programmes, Applied Research Packages and Project Support) reflect differing time horizons and objectives. Project support and, to a large extent, ARPs are based on the provision of technical advice. DRA's ability to provide these services for the MoD is, in turn, based on knowledge and experience gained through SRPs.

With the introduction of trading fund status there has been increased emphasis on short-term issues, often associated with focus on project support and ARP work. The effect of this, a lack of new and innovative SRP proposals, has been magnified by the reduction in spending on long-term research in general.

Unfortunately, such short-termism, in time, will erode the DRA's ability to perform project support and ARP work since it will no longer have the expertise or authority to comment on modern technology. This is a real dilemma, particularly given that the pace of technological change is becoming increasingly rapid.

The need for a coherent and co-ordinated research strategy throughout the organisation is the only means of tackling this problem.

1.3 *How does the DRA's status affect its research strategy?*

At present it is not clear that the DRA has its own research strategy. It is presumed that the MoD as principal customer to the DRA exerts its own research strategy on the DRA. If there is an independent research strategy being pursued by the DRA it does not apply when dealing at a working level with the organisation. Coherence with, and awareness of, programmes would seem to be a prerequisite to any overall research strategy.

1.4 *Research Package Managers*

The Research Package system has seen a fundamental change in the nature of the business relationship between the MoD and the DRA. The key difficulties stem from the relationship between these two parties as customer and supplier.

The direction and goals of the various packages is crucial to the success of the system. There is a major culture change for the DRA in this respect, with work programmes and objectives being directed by MoD. If such a system is to be seen as credible by the staff of DRA the goals and objectives must take into account all aspects of future technologies which demand an understanding of the issues surrounding such technologies. Credibility and this depth of technological understanding is unlikely to be achieved by serving officers associated with such work for a relatively short period of time at MoD. The introduction of research objectives, as seen in some programmes, specifically aimed to investigate the technologies and direction to be pursued by the package may go some way to promoting this cultural change.

There appears to be a fundamental flaw in the concept of Research Package Managers. They are the fulcrum around which the whole Package system revolves, often acting as arbitrators between customer and supplier, and yet are employees of DRA and clearly have responsibilities to the DRA management structure. The need for Package Manager involvement in such issues may be less of an issue in time, as the DRA comes to terms with customer focused business needs.

It could be argued that Research Package Managers should be employees of the MoD, reporting directly to an appropriate MoD body. This move alone would not alleviate many of the problems faced by the Package Managers. Much clearer terms of reference for Package Managers, together with an improved dialogue between the customer and supplier (MoD and DRA) over research direction and objectives, is needed to improve the ARP system.

On a practical level the new procedures are time-consuming and result in protracted decision-making.

1.5 *Relationships with MoD, Other Government Departments and private industry*

(a) The emphasis in treating the MoD as a customer can only be good.

(b) Treating Government Departments as customers will be beneficial.

(c) Relations with private industry will be difficult as long as the DRA are seen as both assessors and bidders on tenders. Also, the stated aim to increase non-military research will sour relationships with the defence industry sector which will not wish to see competition from a MoD owned organisation, with confused objectives, in the non-military sector.

1.6 *Effects on research strategy of changing political circumstance*

The DRA as the primary source of up to date expertise within MoD should be allowed to play an important role in rethinking strategy but the overall responsibility for the necessary rethink must rest centrally with MoD.

3. DRA's Relationship with Industry, Europe and the Wider World

3.1 *Civilian Research*

(a) Transfer of Technology

There is an assumption that the high technology developments in the military sector lead to important spin-offs in the civilian sector. However, evidence gathered by the US Congress shows that in two of the major areas of defence spending, Electronics and IT, the clear lead is in the civilian sector with technology spin-offs to the military. (A recent study of defence spending world-wide indicates 40 per cent is accounted for by Electronics and IT.) In this context the emphasis on civilian research for DRA must be in the context of "catch-up" rather than "pushing-back" the frontiers. Evidence of the difference in technology advances can easily be observed by visiting the cockpit of in-service civilian aircraft versus military aircraft and in-service merchant ships' bridges versus military ships' bridges.

(b) DRA's role in Civilian Research

The UK leads Europe in the provision for the civilian sector of independent contract research and development. A significant number of the companies involved are members of AIRTO. This sector is highly competitive with well organised companies being very successful. It is not clear that DRA is capable of taking a significant share of the work in the sector, given its lack of experience, poor management focus and unwieldy organisation structure. With the principle emphasis for DRA being an independent advisor on military technology it is not clear there would be any benefit from a dissipation of energies in competing with existing companies who are strongly placed in the market place. Not enough is being done at Government department level, ie primarily between the MOD and DTI to establish a coherent framework for supporting generic technology in those fields which have defence application.

3.2 *Technology transfer*

A Government-supported scheme such as the DTI Carrier Technology scheme aimed specifically at carrying technology from the defence to the civil sector should be considered.

3.3 *Connections to Technology Foresight*

No knowledge

3.4 *DRA links with DTI*

No knowledge

3.5 *Defence Technology Enterprises*

The demise of the DTE has not left a void because DTE never established a substantial presence.

3.6 *Diversification and Conversion*

Conversion and diversification is a matter for the defence industry and should be market driven. The role of DRA should be one of supporting rather than leading industry through this process.

3.7 *Dual Use Research*

Where the DRA has an opportunity to establish an important dual-use capability such as the proposed centre for excellence in material science, it should be free to do so. The DRA should have the freedom to build up its dual-use capabilities in any field which the market, including Government Departments, is prepared to support. From an AIRTO standpoint all we can press for is a level playing field with equal access for us to Government funds and no hidden subsidies for the DRA activity.

3.8 *Unfair Competition*

DRA's ownership by MoD, its effective immunity to prosecution for failure to provide services and its insistence on using its terms and conditions, all lead to significant suspicion by private industry on the fairness of competition. DRA cannot be game-keeper and poacher at the same time. It is important that level playing fields are maintained with respect to the costing of DRA services to industry. These services must be based on full economic not marginal costing principles.

3.9 *Collaboration with EC Framework Programme*

We have no evidence of DRA participation in EUCLID or EUREKA. In the EC Framework Programme the DRA has been able to bid for 50 per cent EC funding for programmes for which the other 50 per cent comes from the DTI. In this respect at least in aviation they are no different from counterpart Government laboratories from other EC countries. There is no such funding for AIRTO firms and this puts them at a serious disadvantage. The solution is not to withdraw DTI support for DRA participation in EHC programmes but to make DTI support available to AIRTO firms too for similar EC work.

3.10 *European Collaboration*

AIRTO does not know of a general answer to this but within aeronautics GARTEUR (Group for Aeronautical Research and Technology in Europe) has actively promoted collaboration between the main aeronautical research establishments in Europe for the past 15 years. The establishments recently held a high level conference to debate their progressive evolution through increased collaboration towards European union of research establishments.

3.11 *Management of defence research elsewhere*

Most European countries have a more effective approach to the management of science and technology than the UK.

Letter from the Australian High Commission

Following our meeting at the Science Policy Support Group you wrote to my Staff Officer, Mr Peter Laite, enclosing the call for evidence for your investigation of the DRA. The attached paper *(not printed)* was supplied by Canberra as briefing material for a talk I have to give later this month. Your Committee may find that it provides some interesting background information. You will see it refers to various Annexes; I have these and would be happy to discuss them with you if you wish, but my guess is they are too detailed for your purposes. The paper sets out the management changes which have been set in train in Australia's Defence Science and Technology Organisation (DSTO) during the last 18 months, and the rationale which led to them.

Although the terminology is slightly different, you will see that DSTO has introduced something very like Package Management. The reporting of the research programme has been aligned with military objectives so that the service customers can see clearly the work and resources that are devoted to their future requirements. Through review meetings, they can then influence the content and priorities of the programme.

Each of the four laboratory directors has been appointed co-ordinator for one of the main programme blocks and there are DSTO divisions addressing the operational problems of each of the services. There are, thus, clear points of contact for each service. The actual research, however, is funded by a block vote from the Department of Defence to the Chief Defence Scientist who is accounting officer for it. His role is exactly that of the Controller Establishments Research and Nuclear (CERN) before the DRA was created.

My Staff Officer was a Package Manager in the DRA before retiring from Fort Halstead two years ago. He has commented that whilst the DRA needs something like Package Management as a contractual tool, the application of the customer-oriented principles of Package Management does not necessarily require the DRA form of commercial organisation. The introduction of Package Management preceded the formation of the DRA by 18 months and it may have worked just as well under the old Vote system. It was a totally separate initiative that became inextricably linked with the DRA simply because of timing.

Letter from James F Barnes CB

I have enclosed an original typescript of my evidence, which is confined to Question 1.7.

During the 1980s there was an examination within the MoD of all the categories of defence equipment. It concluded with recommendations, for each category, as to which of the three stances (expert customer, intelligent customer or ordinary customer) the department should take in future. The work was done against a background of pressure on the defence budget and a resulting need to be selective.

It is nearly five years since I retired from the post of Deputy Chief Scientific Adviser to the MoD. Although I still act on behalf of the department as chairman of its Individual Merit Promotion Scheme for scientist and engineers, the Defence Research Agency runs its own separate scheme and I have therefore no detailed information about its research programme and the facilities and capabilities which it retains. Nor am I aware of any activity to bring up to date the earlier examination of customer stances. However I am sure that there are scientists and others in senior positions within MoD who will recall it (and who could produce a copy if asked).

Question 1.7. How far should the DRA continue to provide other (non-research) services, and to whom?

I shall confine my evidence to this question and specifically to the provision of such services by the DRA to the MoD. I shall show that it can only be answered fully if the MoD has recently defined the areas in which it intends to exert a significant influence on the technical aspects of the equipment it intends to procure.

BEFORE THE DRA

The predecessor organisations of the DRA enabled the MoD to act, if circumstances demanded, as an "expert customer" in certain highly specialized categories of military technology. The main examples were development, testing and production of nuclear warheads, chemical and biological defence, some elements of secure communications and some aspects of explosives technology. For most classes of defence equipment, the services provided would be less comprehensive but would enable the MoD to act as an "intelligent customer". Only in relatively few categories of equipment for the armed forces did the MoD act as an "ordinary customer", with no specialised knowledge and employing only normal commercial prudence.

Expert customer status meant that within the MoD there was a highly specialised and often unique capability to design, develop and manufacture; and that industry, to the extent that it was involved, had a role somewhat similar to that of a sub-contractor manufacturing under licence. Most of the requirements for expert customer now reside outside the DRA.

Intelligent customer status meant that the MoD possessed sufficient knowledge to exert a significant influence throughout the procurement cycle. Research establishments would assist the MoD as an intelligent customer in any or all of the following:—

(a) Analysis of the threat;

(b) Operational analysis and war games;

(c) Studies to help define specifications;

(d) Examination of prospects for international collaboration to procure equipment;

(e) Preparation of invitations to bid and evaluation of the responses from industry;

(f) Assessment of trials and of applications for type approval or certification;

(g) In some cases, conduct of trials and tests on facilites unique to the establishment;

(h) In few cases, operation of pilot plant manufacturing facilities, for example new explosives or propellants and new electronic materials;

(i) Activities of a "trouble shooting" nature;

(j) Improvisation of equipment for the armed forces to meet an urgent unforseen need.

All of the above would involve close co-operation between the research establishments and the relevant branches of the MoD headquarters. For all but the last two, the services provided would be in response to formal requests from headquarters and would have to be carefully planned to take account of the fact that in most cases a specialist team in an establishment would be required to give assistance, either simultaneously or in sequence, on more that one project.

The MoD was an intelligent customer for warships, armoured vehicles, army engineer equipment, guns, missiles, ammunition, command, control and communication systems and most classes of military aircraft.

Examples where the MoD was an ordinary customer include the following:—piston aero-engines, transport aircraft, trainer aircraft, motorcycles, other non-armoured road vehicles, rocket launchers for space-borne systems, and some categories of small arms.

THE PRESENT POSITION, AS PERCEIVED FROM OUTSIDE

Unless the MoD has decided to relinquish intelligent customer status for some categories of defence equipment and to adopt from now on the stance of an ordinary customer, it follows that all of the services listed as (a) to (j) above will continue to be needed. Some test and evaluation facilities are now part of a separate organisation but, in the absence of an alternative arrangement for all the other services, the DRA might be expected to provide them, perhaps in competition with others. However a word of caution is needed here.

Studies, operational analysis and assessments can be performed by industry and other specialised agencies, but only if the remit is carefully formulated and the work is monitored. The obvious body to help the MoD with formulation and monitoring would be the DRA—provided of course that it has a relevant on-going programme of research.

Help with trouble shooting and rapid response to urgent unforseen requirements have in the past depended very much on the expertise and experience that has resided in the research establishments. To the extent that areas of research activity may be given up, the specialised knowledge to make such a rapid response possible will also disappear, in some cases very quickly.

IN CONCLUSION

The only way to answer question 1.7 fully is for the MoD first to produce a list of all the categories of defence equipment where it wishes to remain an intelligent customer. The MoD should then indicate the extent to which long term support for activities (a) to (j) above is likely to be required from the DRA in each of these categories of equipment.

Letter from the Civil and Public Services Association (CPSA)

I am writing on behalf of Mr Ralph Groves to submit CPSA comments on the Defence Research Agency. We have limited our response to the questions which we believe our members are best qualified to answer as follows:—

1.1 We are concerned at the relationship between MoD and the DRA. On certain issues such as personnel matters and financial areas DRA appears to be an independent entity, on other occasions, the DRA seem to be "locked into" MoD. This uncertainty can be confusing for staff and affect morale.

1.2 DRA's Trading Fund status carries with it a whole structure of accountancy procedure which appears to fall on scientific and technical staff thus making a less than effective use of resources, diverting scientific and specialist expertise from the research area. The focus on financial success means that products are dependent on customer support for viability, this results in a short term view of development which could have a negative long term outcome which may limit advances in technology. Scientists are currently researching through existing published knowledge which keeps down costs but limits the motivation and scope for innovation.

1.3 The administration does not appear to be cost effective with many scientists covering routine administrative duties and no longer able to concentrate on scientific work. This will be further exacerbated by redundancies of support staff.

2.1 We believe excellence may be affected by restructuring. Levels of expertise need to be more accurately determined, a future grading exercise may reflect this. Budget targets are being met by shedding support staff and services whilst there may be areas where over-staffing occurs elsewhere the balance may swing in the opposite direction, in some areas grade 6's and 7's scientists are doing administrative officers and executive officer's work, operating word processors and writing cheques.

There is also the possibility that the restructuring has created smaller units where emphasis is on keeping that sector and encourage loyalties to the group rather than the Agency. Duplication of effort with an extra layer of bureaucracy may also affect quality, with each business unit run independently.

2.2 The Rationalisation Programme has been deemed successful. However as mentioned above the various business units mean a duplicaton of effort and "variation in company policy decisions". Although speedy results are possible one can question if they have left a sound enough structure for future development and consolidation. An example is the making of a specilised container for a site, local company price £300 but Engineering Services £2,000 due to overheads. This is not cost effective by any standards.

2.3 All staff must be seen to have fair and equitable pay system and decent levels of pay to retain skilled staff includng those not deemed specialist.

3.1 We believe the DRA can produce viable commercial spin-offs and that this should be a major concern. We would like to see more defence diversificaton in the future from all of the Defence sector to protect the livelihood of members and their families especially in the communities heavily reliant on the defence sector.

3.6 CPSA along with other Trade Unions have lobbied for more to be done in the defence diversification area. DRA as a focal point for research has an important role to play. As a major employer in many small communities they also have a responsibility to carefully consider short term savings in redundancies over maintaining a skilled workforce with sufficient expertise to diversify and possibly manufacture on a limted scale. The skills are there at the moment but must be protected for the future.

Memorandum from Professor M Cordey-Hayes, Cranfield University

SUMMARY

This paper addresses only part 3 of the Call for Evidence notes, ie the DRA's relations with industry, and in particular it focuses on the questions relating to technology transfer. It considers the notion of civilian spin-off to be an inappropriate conceptualisation of the process of technology transfer and one which implicitly has led to wasted efforts in some of the activities of DTE and other technology transfer intermediaries. These activities implicitly assume that increased exposure, or accessibility, to technological ideas does in some unspecified way result in beneficial technical changes in industrial companies. While such provision of access to technical ideas is a necessary part of technology transfer, it is only one component of a more complex process. Thus, "spin-off" should be re-envisaged as a process of knowledge transfer recognising that most organisations do not have a technology shopping list but rather they have an ill-defined set of problems that could, directly or indirectly, be alleviated by technological change. Seen in this way, the evaluation of the recipient organisation's needs and the evaluation of the technological opportunities in the light of these needs are important to the transfer process and correspondingly are essential activities of intermediaries engaged in technology transfer.

From this point of view, it is concluded (in paragraph 4) that to be effective in defence-civilian technology transfer, it may well be more appropriate for DRA to work in a co-ordinated way with a few selected intermediaries who have a proven record of success in technology transfer. There are also areas where DRA could play a more strategic role related to technology transfer, working with the OST Technology Foresight exercise.

1. The rate of industrial technological innovation in the UK is generally considered to have lagged behind that of many other industrialised countries despite the widely held belief internationally that the UK is still an effective source of inventions and innovatory technical ideas. The dependence of such innovation on the external acquisition and subsequent exploitation of new technologies by industrial organisations has been recognised in government policy towards technology transfer. Less thought and research has been focused on the relatively low levels of technological innovation actually achieved and on the difficulties of exploitation of new technologies within companies.

Technology transfer has largely been seen in terms of making adequate provision of technical ideas on the assumption that increased exposure to these ideas would result in beneficial technical changes in industrial companies. Of course, such provision of technical ideas is a necessary part of technology transfer but it is only one component of a more complex process. Emphasis should be placed upon the concept of technology transfer as a process and this wider view of technology transfer is taken to mean:

> the process of promoting technical innovation through the transfer of ideas, knowledge, devices and artefacts from leading edge companies, R&D organisations and academic research to more general and effective application in industry and commerce.

This view of technology transfer has been developed as a consequence of observations about the limitations and deficiencies of much technology transfer research and practice. A case study of Defence Technlogy Enterprises formed one component of the work.

2. The general argument forwarded above equally applies to the case of Defence Technology Enterprises Ltd (DTE). Initially DTE's role was as a collator and repository of technical information appertaining to the technological results of the defence research and its potential civilian uses. It was considered that the undeniable quality of the research work would produce equally undeniably useful technology which would be sought by the majority of technologically aware organisations.

Once again it has been assumed that if access to the technology could be provided then the quality of the technology would demand its application. Such a belief concentrated efforts on increasing the number of technologies that could be made available to the members. When this strategy began to produce only minor results, DTE switched to providing "spin-off" by financing the re-development and commercialisation of a very small number of potentially valuable technologies. To this extent the emphasis had moved away from providing access to technology. However, the imperative for their activities had not changed; they were still technology driven. Activity which is technology-centred rather than organisationally-centred fundamentally produces an accessibility lead process.

3. A programme of research projects at the Innovation and Technology Assessment unit (INTA) at Cranfield University suggests that most current technology transfer mechanisms exhibit one or more of the following limitations or deficiencies.

— They fail to recognise adequately the significance of recipient organisations' needs and therefore fail to address service delivery aspects of the technology and knowledge transfer process.

— The mechanisms tend to offer "technology" primarily in terms of technical and economic attributes ie as a product, thus failing to consider the responses of organisations and the individuals within them to the opportunities and threats generated by technical change and therefore failing to understand the actual, and generally more limited, contribution of a candidate technology to competitive advantage or effectiveness.

— They under-estimate the importance of the interactive processes and mechanisms between the donor (vendor, intermediary, R&D organisation etc) and the recipient, necessary for successful transfer. They fail to recognise that successful transfer seldom involves just a simple one-off transaction but is a process or dialogue between a variety of actors in the two parities and involves a continuing relationship to the point where real benefit accrues to the recipient.

— They assume that technical change is explicitly a priority as far as the organisations are concerned and, even when this is so, that organisations are readily able to diagnose their problems in terms of technical change and subsequently to articulate their needs in well specified technical terms. The tendency is to assume that organisations have a well defined shopping list rather than a set of ill-defined business problems of which technical change may only be one.

The deficiencies outlined above arise because many transfer mechanisms and organisations fail to apply a sufficiently "client need" oriented approach.

4. From the point of view developed in the above paragraphs, two main conclusions relating to DRA's role in technology transfer from the defence to civilian sector arise. These are:

(i) To be effective in making a contribution to the innovation capabilities of British industry through technology transfer activities, it is necessary to provide a carefully considered technology consultancy service of the type implied above. DRA are likely to achieve success at this only if they co-ordinate their activities with those of the DTI and also work closely with a few selected technology transfer intermediaries who have a proven record of success in technology transfer.

(ii) Possibly a more important activity than these day-to-day technology transfer activities (which could be subcontracted elsewhere), is a strategic role allied to the OST Technology Foresight exercise. Technologies should be identified which could, with suitable modifications and development, contribute to a strategically targeted RTD programme. An example of this is the recent US initiative to develop a "clean car" with the former defence related laboratories and industries contributing to, and competing for, contracts in this strategically identified RTD programme.

Memorandum from Alex Crawford, Editor, Laboratory News

DEFENCE RESEARCH AGENCY AND CIVIL ACTIVITIES

The idea that defence research establishments might assist UK industry by transferring technology developed for military purposes to the civil sector has a certain attraction, particularly among defence scientists and engineers, but it has frequently been frustrated in practice (Refs. 1-3).

When the Government's White Paper on Science, Engineering and Technology (SET) was published last year, the failure to integrate strategies for defence and civil R&D was apparent. The strategy for defence R&D was kept firmly within the control of the Ministry of Defence (Ref. 4).

The "ring-fencing" of the DRA's activities in this way has been apparent at Farnborough in Hampshire, where the DRA is following through a plan to rationalise on a site of some 360 acres, with the MoD intending to sell off a further 820 acres.

This rationalisation plan does include provision for the DRA's first dual use technology centre (DUTC)—the Structural Materials Centre (SMC). However, the SMC was planned before the concept of "dual use technology" was adopted by the DRA (Ref. 5), and 80-90 per cent of the work in the SMC will continue to be done by DRA staff, mainly on MoD contracts. The SMC is intended to serve customers from the civil sector and its internal DRA customers on an equal basis. However, it could be difficult to graft the commercial attitudes required in its rôle as an international supplier of contract R&D onto the DRA, the mission of which is to be the prime provider of research and technical advice to the MoD.

The MoD controls the DRA's finances and capital spending, in particular. At present, under the terms of its Framework Document as an Executive Agency of the MoD, the DRA is allowed to borrow only from the MoD, and, apparently, the MoD and the Treasury would wish to go over in detail any novel proposal that would require the DRA to increase its current level of borrowing (Ref. 6).

The difficulties of conversion to civil work are well recognised, and point to the need for the MoD and the DRA to help the local area to diversify:

> "... a more fruitful approach may be to make a distinction between conversion and diversification. A defence dependent region can adapt itself to reductions in the defence market, not through the conversion of particular factories, but rather by promoting the start-up and growth of civil production in general. Rather than attempting, often unsuccessfully, to graft commercial attitudes onto firms with traditions of cost-plus contracting with the MoD, this approach to diversification focuses its efforts on

> firms which are completely civil through and through. If successful the diversification efforts will lead to the creation of jobs in which former defence workers can utilise some of their existing technical skills, whilst also learning new social skills and adapting to a differing organisational approach." (Ref. 7.)

The rationalisation of the DRA at Farnborough over the next two years could provide the opportunity to test possibilities for diversification, but that would require changes in policy by the MoD and the DRA if diversification was to be carried out effectively. Such changes in policy could be justified on the basis of the argument that diversification needs to take into account social and economic programmes to convert communities from total reliance on defence (Ref. 8).

Whilst the DRA may make some contribution to civil R&D through its DUTCs, such as the SMC, this contribution may be limited unless several issues can be addressed:

- — the DUTCs need to be designed to take into account the needs of targeted markets, other than the defence market;
- — the DUTCs need to employ sufficient personnel with training and/or experience in international sales and marketing of contract R&D facilities;
- — the DUTCs need to be equipped to meet the needs of customers from the civil sector, as well as the needs of internal customers;
- — the DUTCs need to have access to finance for capital projects that will allow them: (1) to implement strategic plans for 5-10 years ahead, and (2) to respond to short-term peaks in demand for their services;
- — the DUTCs need to have budgets, with milestones, which are sufficiently robust to take into account variations in the DRA's budget due to possible changes in the market for its services, such as the MoD awarding an increasing proportion of contracts for R&D to competitors in industry. (Ref. 4.)

However, apart from the development of DUTCs, the MoD and the DRA at Farnborough should have, as an objective of policy, to compensate for declining employment in defence work and defence R&D by increasing the overall level of civil employment by, for example:

- — the MoD drawing up an integrated plan for the whole Farnborough Airfield site (including the DRA enclave and the 820-acre site that the MoD is due to dispose of in 1996). That would require the MoD and the Treasury to examine the current (overriding ?) policy that the 820-acre site should be sold to the highest bidder, particularly as that policy was conceived at the height of the property boom, when land values and demand were much higher.
- — the MoD drawing up a phased programme for release of the 820 acres to take into account the future needs of:
  - — the area and the region for economic development; and
  - — the Farnborough College of Technology for land on which to develop into the University of North Hampshire.
- — the DRA becoming involved as a partner in a Farnborough International Science Park (FISP) on part of the 820-acre site that it is releasing. The FISP would build upon the high-technology image of the area, which is associated around the world with the Farnborough International Air Show. However, it would be important not only to attract defence firms to the FISP but also to attract other high-technology industries of the future (such as biotechnology, communications, environmental technology, and others that may be identified in the Office of Science and Technology's Technology Foresight exercise). It would also be appropriate to promote the FISP to attract headquarters and laboratories for multinational companies, and UK Government and European Union institutions.
- — the MoD, the DRA and Department for Education, the Department of Trade and Industry, and the Office of Science and Technology supporting the proposed National Science Centre (NSC). The NSC would be an educational trust aiming to motivate young people to become involved in SET and to promote public understanding of science. The NSC could include facilities such as:
  - — interactive models providing hands-on activities suitable for children of different ages, taking into account the themes in science, technology, and information subjects in the National Curriculum and in post-16 education;
  - — flexible halls for mounting temporary events, experience and exhibitions on SET issues of topical concern;
  - — an Omnimax theatre;
  - — a permanent base for mobile exhibitions that could be set upon in schools, colleges, shopping malls or town centres to take interactive shows about science to young people and the public; and,
  - — a demonstration laboratory on a network with monitors in the NSC, also accessible from school laboratories linked in around the country.

The strategy of developing the Farnborough Airfield site by bringing together the DRA, British Aerospace (which has its headquarters there at present), the FISP, the NSC, and the University of North Hampshire would be to act as an engine of ecomonic growth not only for the local area but for the region. The opportunities for cross-fertilisation of ideas and experiences would be encouraged within such a positive framework, as the culture of the local community would be oriented towards SET.

This is a true diversification strategy, as it implies a widening of the employment base without abandoning defence work. However, its success depends on the Government co-ordinating an integrated approach, planning for the long term, and investing for the future. As Steven Schofield concluded in an article last year:

> "The concept of conversion needs to be broadened so that irrespective of the fate of particular military-industrial sites, a variety of mechanisms can be brought into play to be located in the broader framework of industrial, technology and regional policy rather than remain reliant on an isolated and inappropriate model of industrial change." (Ref. 8).

CONCLUSION

The House of Lords Select Committee on Science and Technology enquiry into the DRA provides the opportunity to examine the rôle of this agency in relation to civil activities. The DRA could be encouraged to diversify by reaching out from its site at Farnborough in Hampshire, but, for this to be effective, would require the support of several key Govenment departments, such as MOD, the Treasury,the DfE, the DTI, and the OST, to be co-ordinated.

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Letter from the Defence Manufacturers Association

In response to your letter of 22 November 1993 we asked our Members to deal direct with you on any evidence they wished to provide. Two members have written to us instead since they do not wish to be identified. Their submissions labelled cases I and II are enclosed and I hope they will be of assistance even though the request date is now past.

CASE I

TOPICS: CONFLICTS OF INTEREST AND POTENTIAL UNFAIR COMPETITION WITH PRIVATE INDUSTRY

CALL FOR EVIDENCE QUESTIONS 1.5 AND 3.8

1. INTRODUCTION

The DRA is undergoing significant change at a time when large pressures are being exerted on the nation's defence budget which are leading to changes in the DRA's future funding. Within some of the MoD's budgets allocated to research and development the proportion attributed to the DRA is also being progressively reduced. As an agency of the MoD, the DRA is under pressure to meet financial targets.

The above factors are beginning to result in conflicts of interest within the DRA and offer potential for the organisation to compete unfairly with private industry. Both issues are linked to the MoD's policy of procuring major equipments via prime contracts through which procurement risk is transferred to the prime contractor.

2. Conflicts of Interest

Prime contractors represent a largely untapped source of income for the DRA and the DRA intends to support both MoD PE and prime contractors on the same projects. As an organisation it will thus be involved in both the support and adjudication of rival bids, a significant conflict of interest possibly exacerbated by the different benefits available to the DRA within competing bids.

The DRA has declared that:

> "DRA is prepared to undertake sub-contract work for MoD prime contractors at a level of risk which is commensurate with the scale and nature of DRA's involvement."

A further conflict of interest could result from the circular transfer risk from MoD PE to prime contractor and back to the MoD (DRA), a position which also erodes the MoD's ability to transfer risk through prime contracts. For example, during the performance of prime contracts the DRA may be advising both the customer and the supplier who are in dispute over a contract's performance and the associated level of liquidated or consequential damages.

The topic of competition with private industry is linked to the above issues and is dealt with below.

3. Potential Unfair Competition with Private Industry

The DRA does not have a consistent position with respect to competing with private industry. Although the DRA will not manufacture hardware in competition with industry, all of the above discussion indicates that it intends to compete in the area of intellectual property and endeavour. This competition is unfair in that the DRA has been equipped at the tax payers expense with the very intellectual property which it will use to support prime contractors and which is not available to other competitors. Competition would thus only be fair if the valuable knowledge and data of the DRA were to be made available to all competitors wishing to undertake research on behalf of the MoD and support prime contractors.

There are two main drivers for competition between the DRA and private industry:

1. the DRA's wish to support prime contractors;
2. possible competition for DRA's traditional sources of funds.

The organisations which offer competition to the DRA in these two areas are those which already support prime contractors and work under contract to the DRA. The size of these organisations varies from small, highly skilled companies which are very dependent upon contracts from the DRA to large defence companies. The DRA's position requires clarification since a significant potential for unfair competition exists:

1. It is possible that the DRA could use its position as part of the MoD (ie advising the MoD on tender adjudication and contract performance) to persuade prime contractors that they should use the DRA's services in preference to competing private companies;
2. It has been suggested that parts of the DRA already perceive that private industry represents competition within its markets. Clearly a mechanism exists by which the DRA could possibly render some of these competitors harmless (not financially viable) through the operation of an unfair tendering process for placement of its extramural research contracts. The DRA would be able to exclude selected companies from competitive tenders or mark down those companies' tenders.

This latter point raises an important issue which requires clarification, ie should the DRA be free to behave as a commercial organisation competing in its market place or if it were to behave as such would it be a government agency, responsible to the Secretary of State for Defence, indulging in unfair practices?

CASE II

The following comments are offered in support of the above Committee's investigation into the DRA. These are perceived actualities, and if at variance with the official policy concerning DRA activities and status, indicate a public relations failure on behalf of MoD and DRA, or a disparity between what was intended and what has transpired.

The comments that follow, are in broad conformance with the order of topics in the questionnaire.

1.1 and 1.2 As an executive agency of the MoD, it is difficult to imagine the DRA being independent of it. The DRA is perceived to be implementing MoD policy, and to be predominantly committed to work in support of unforeseen in-service equipment problems, and new weapon clearances (ie "fire-fighting").

Trading fund status, insofar as it gives DRA greater freedom to dispose of its annual allocation in the way it wishes, appears to threaten the proportion of that fund which is allocated to meaningful research. The apparent situation is that with the passing of time, scientific and engineering staff are being, in effect, replaced by management and administrative posts. Indeed there appear to be areas of previous expertise (eg high tensile ferrous metals and airborne weapon suspension systems) which are no longer intramurally supported.

It is perceived that largely due to DRA's abdication from many research areas, together with MoD's irrational obsession with Total Prime Contractor Responsibilities ("Eyes on, hands off") that EF2000 is such a shambles, and will probably be obsolete when it enters service. The almost total pre-occupation with the change to DRA status, trading fund planning, and re-structuring has resulted in the tragic loss of a wealth of expertise, and a four year "research vacuum" since 1989. In consequence, the Research Package system is attempting to address issues which would have otherwise been maturing in an RAE/Industry partnership, but which have instead been neglected or still-born. This backlog of research/study work is now being only partially addressed in a dwindling budget environment, which means that it has little prospect of ever catching up.

Lack of funds within industry, due to contracting business levels, abortive bids, and minimal margins, means that the concept of industry sponsored research (or even partially sponsored) for MoD's benefit is ill-timed, and ill conceived. As far as "UK Ltd" is concerned, the emphasis should, for the time being at least, be on Technological progress and "who will/might buy it?"

1.6 The so-called "threat" assessment/criterion, to the extent that it can be defined, is a nonsense. The name of the game may have changed in that we may not be directly threatened by the old USSR, but we are still competing with them in a business sense, and may indeed be threatened by their customers! The only difference (perhaps) is that the numerical supremacy of our previous adversaries may have diminished, but as we have reduced our resources also, even this may be chimeric.

It is very nearly too late to be pondering the need for retaining technological capabilities within the UK. Even industry is having difficulty justifying the retention of experienced and inventive personnel. The assessment of the competitive threat from abroad should be a continuous task for the DTI, and this should be accompanied by a strategy for action when UK technologies are threatened. Instead, the government agencies have seemed too eager to jump on a plane to explore what they can buy from other more forward-thinking nations.

1.7 The DRA should be a centre of excellence for basic research in areas of materials, aerodynamics, weapon technology, threat detection, secure communications, and weapon terminal effects, and it should share the benefits of its findings with a production-oriented industry. It should also share some of its funds to sponsor applied research in industry, where the end game is either a better product for the UK forces, or an export opportunity (ie world competition).

Other non-research scientific and technical service business should be shared with industry where security and know-how permits. It is suspected that this aspect of the DRA workload in recent years has been due, in part, to the demise of companies who have been victims of MoD's parsimony, and part due to a need to justify their own existence in the absence of a research policy and associated funding.

2.1 Restructuring is already affecting excellence. Many irreplaceable records have been destroyed and expertise lost. It will probably get worse before it gets better (if at all). "Budgetary challenges" is a euphemism for "lack of funding", and it is time MoD learned that you get what you pay for (at best).

2.2 The RAE/RARDE/etc (as were), were the result of almost a century of evolution, and whilst they must have had their inefficiencies, had the respect of industry as well as that of foreign governments. It is easier to destroy than to build, and the DRA is seen to be a mere shadow of the establishments it replaces, and is still in a state of decline. This is partially an inevitable result of the policy which changed it, and the imposed rules under which it must operate.

2.3 The decimation of the Defence Industry should have released a plentiful supply of talent, but there may be many who would rather retire early than move into an establishment in decline. It is known that recruitment at scientific levels has been difficult but it is not known whether this is due to an adverse relationship with non-productive staff salaries, which would come as no surprise, if true.

2.4 Pathfinder is the DRA's programme to allow industry to fund MoD's research objectives. Pathfinder does not seek ideas but instead seeks a cheap solution to a perceived threat. The relationship with industry has changed from one where the research establishment identified a technology which required industrial input and funded this assistance, to one where the DRA solicits complete solutions to simplistic threat definitions, which they are not willing (or able) to fully define. Cynically, it could be said to smack of "I don't know much about defence technology, but I know what I like".

2.5 We would all like to know the answer to the first question, and have grave doubts about whether much at all is well thought out these days. In view of the UK's excellent past aerospace/defence export record, we should be in the first division of Aerospace/Defence Research nations, with priorities being set on the basis of export opportunities and world competition. The UK services' and airlines' needs would automatically be met by the fall-out from this policy, and there would be something to motivate and inspire the scientists and engineers that the country needs to regenerate its industrial base.

3.1 There was a time when civil aviation depended upon RAE research in aerodynamics and materials. This resource is lamentably tenuous at present, and desparately needs strengthening. On the other hand, it is naive and facile to expect any significant civil spin-off from defence oriented work, apart from the fact that it inspires and motivates the best brains, (or at least it used to!) some of which use their talents in civilian problem solving. The attraction of defence engineering was that the problems were challenging and generally well defined. In civil life this is less often the case, but put a defence team together with a definable civil challenge, and the result will be a world class solution. A strategy is needed to capitalise on this phenomenon.

3.4 There is too little DTI involvement in anything useful.

3.5 Is there (was there) a void? Most of us didn't realise it (the DTE) had gone. Forget technology transfer—if it is possible and economic it will happen. What matters is the problem solving ability that the training engenders in the aerospace/defence sector.

3.6 Materials research and classification perhaps?

3.7 It should be a source of data and expertise. However, with the loss of records, expertise and experienced staff, the time may have passed when this could be fully implemented. The nearest thing to a model, in this respect, is PERA, who, by subscription, offer an information service on matters technical and commercial.

3.8 This is of less concern now than it was a few years ago when the DRA was announced, largely because of its inexorable decline. It seems, however, that the DRA, hungry for work, is getting first option on any study work that might emanate from MoD, and non-competitively at that. And yet the DRA itself enforces a draconian interpretation of MoD's edicts on competitive tendering.

3.11 Yes. eg. the French have a much more supportive attitude toward their specialist industrial companies, and seek to moderate monopoly generating policies such as observing strict "cheapest bid" tender assessments.

SUMMARY

It is perceived that the DRA, being itself a product of MoD's obsession with cost reduction, is exchanging cost savings for a reduction in capability. Also, it is changing from an organisation that benefitted industry, to one which benefits from industry. Largely as a result of the attitude that seeks merely to counter subjective threats, the opportunities to secure long term business for the UK Defence Industry are being squandered or ignored. Technology transfer from Defence to the civil sector is something that can only be achieved while there is a Defence sector, and its best chance is by motivation and inspiration of a new generation of technologists. MoD in general and DRA in particular are not helping in this respect.

Supplementary Memorandum from the Department of Trade and Industry

Q1. *Please supply a time series of DTI funding at DRA and its precursors, broken down by programme and by DRA establishment or business sector, covering the 6 years up to the present and projecting forward for the next three years.*

ANNEX A—CARAD

Annex A shows DTI funding of intramural work at DRA under the CARAD Programme. Prior to the formation of the DRA, most of this work was undertaken at Farnborough/Pyestock. CARAD work is now effected through DRA'a Aircraft Business Sector and most of the work continues to be undertaken at Farnborough/Pyestock.

It is not possible to project forward for 3 years for CARAD, as the current programme will finish in 1995/96. Beyond then the nature and scale of civil aeronautics funding at DRA has yet to be decided.

ANNEX B—BNSC

Annex B shows DTI funding of intramural work at DRA under BNSC's programme. Until the foundation of the DRA, RAE Space Department at Farnborough undertook the Earth Observation and Technology/Launchers Programmes and FSRE Defford undertook the Telecommunications Programme. Since the foundation of the DRA, all three programmes have been undertaken through DRA's Command and Information Systems Business Sector.

ANNEX C—MALVERN

Annex C shows DTI funding of electronics R&D at DRA Malvern; the figures show total funding of the projects listed in the answer to Q2.

ANNEX A

DTI Aeronautics funding for Intra-Mural programme at DRA

£m

A&Ae			*CARAD I*			*CARAD II*		
87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	95/96
13.3	13.5	12.9	8.8	6.6	7.7	8.4	8.1	8.2
	39.7			23.1			24.7	

A&Ae—Aircraft and Aeroengine Research and Demonstration Budget
CARAD—Civil Aircraft Research and Demonstration (CARAD) Programme

Basis of figures:
FY97/88 to 92/93—Expenditure
FY93/94—Forecast
FY94/95—Planned
FY95/96—Indicative

ANNEX B

DTI Intramural Expenditure at DRA for Space Research and Development (£m)

	88–89	89–90	90–91	91–92	92–93	93–94	94–95	95–96	96–97
Earth Observation	3.1	3.4	4.9	2.4	3.3	2.7	1.6	1.3	1.2
Telecommunications	0.9	0.9	0.9	0.5	0.5	0.2	0.1	0.2	0.2
Technology–Launchers	2.0	1.8	2.0	1.0	0.4	0.4	0.3	0.2	0.2

ANNEX C

DEFENCE RESEARCH AGENCY—Projects supported by DTI at Malvern 1987–88 to 1996–97

DTI Grants to DRA, all programmes—Expenditure in £k by Fiscal Year

1987–88	88–89	89–90	90–91	91–92	92–93	93–94	94–95	95–96	96–97
5,851.4	3,423.4	1,425.0	730.6	1,205.7	1,138.5	557.0	508.1	193.0	65.6

Q2. *In q. 77 you refer to having a "long list" of projects at DRA in which DTI is involved. Please supply this list.*

The DTI has supported/is supporting DRA Malvern's participation in the following electronics programmes:

Project title	*DTI programme*
Systolic arrays for high performance digital signal processing	IEATP
Ella (computer language) behavioural synthesis	IEATP
High level tools and testability	IEATP
Silicon bipolar transistor	IEATP
Limited reaction processing	IEATP
Dielectrics for advanced CMOS (silicon chip) gates	IEATP
Speech recognition techniques	IEATP
Concurrent object oriented languages "COOTS"	IEATP
Fault tolerant multiprocessor systems	IEATP
Non-linear algorithms	IEATP
Contextual reasoning framework "CLARE"	IEATP
Formal verification support for ELLA	IEATP
Vision by associative reason	IEATP
Knowledge based modelling system	IEATP
Office dictate	SALT
Metal organic molecular beam epitaxy	ATP
HB transistor circuits and technology	ATP
Improved gallium arsenide substrate	ATP
Damage free deposition	ATP
Defence free etching	ATP
New quantum electronic development	ATP
Bonded etched silicon	ATP
Silicon hybrids	ATP
Advanced lithography research initiative	ATP
Pattern recognition	ATP
Porous silicon development	GICP
R&D Programme 1988/89	GICP

R&D Programme 1987/88	SFI
Comp security/formal methods	SFI
High integrity systems	SFI
Wideband optical R/F networks	LINK
Optimisation of autoclave/RTM	LINK
EUROCOMP	EUREKA
Object identification from 2D	ALVEY
Liquid crystal silicon matrix	ALVEY
Thin film electroluminescent	ALVEY
Large panel storage display	ALVEY
Real time 2.5D vision	ALVEY

Note:

ATP = Advance Technology Programme
GICP = General Industrial Collaborative Programme
IEATP = Information Engineering Advance Technology Programme
SALT = Speech and Language Technology
SFI = Support for Innovation

Q3. *Please explain what GARTEUR is, and what is the level of DRA and, if any, DTI funding?*

"GARTEUR" is the Group for Aeronautical Research and Technology in Europe. GARTEUR was formed in 1973 by representatives of government departments responsible for aeronautical research in France, Germany and the United Kingdom. The Netherlands joined in 1977 and Sweden in 1991.

GARTEUR aims to strengthen collaboration between European countries with major aeronautical research capabilities and government funded programmes. Initially, GARTEUR activity was restricted to information exchange and some limited cooperative programmes. As GARTEUR activities expanded, it was agreed that they should cover the promotion planning, coordination and review of joint activities. An MoU setting out the principles for cooperation came into effect in April 1981. Today, GARTEUR's major objective is to promote joint research work by member states' industry, governments and research organisations in fields suitable for collaboration.

GARTEUR activity is governed by a Council, under which are five Groups covering the main areas of aeronautical R&D; these in turn are supported by Action Groups for specific projects. GARTEUR has operated about 45 Action Groups since 1982, 25 of which have completed successfully their activities. In recent years some proposals by Exploratory Groups have succeeded in becoming the nucleus of proposals for projects sponsored by the European Commission. Whenever such projects are approved, GARTEUR ensures that the work is not duplicated in its Action Groups.

GARTEUR is an umbrella organisation and has no discrete funding. Participants in GARTEUR projects must provide their own funding or seek support for their participation from other sources. Some DRA projects that are being pursued under the GARTEUR umbrella receive partial CARAD support. These are mainly within the DRA intramural programmes although there are a few minor projects supported in industry. It is difficult to gather the CARAD funding within the DRA intramural programme that is related to GARTEUR, as individual projects are subsumed within wider ranging costed work proposals. DRA are better placed to advise on their participation in and funding of GARTEUR projects.

Q4. *DTI state in paragraph 24 of its memorandum that DRA is talking about collaboration to 6 aerospace research establishments in Europe. Can you supply further relevant details as to the research project collaboration, pooling of resources and division of labour among facilities?*

The initiative referred to concerns an examination of the possibility of strategic alignment of the European research establishments. It is still in the very early stages and the details of collaboration and pooling have yet to be worked out. In the meantime collaboration on specific projects continues, as mentioned in reply to Q3.

The aeronautical research establishments of the main aeronautics countries of Europe (UK, France, Germany, Netherlands, Italy, Spain and Sweden) have jointly produced a report on future collaboration. This follows a number of earlier references to the need for more collaboration in aeronautical R&D within Europe as the best—if not only way—of effectively competing with the USA.

The report notes that the establishments have similar missions but with varying roles, size, funding regimes and defence interests. Some common research goals are already pursued through existing collaborations, for example through GARTEUR. However, the report highlights a number of drivers for increased collaboration, the most important of which is the need for a European response to USA competition.

A key feature of the report is the vision of a joint future involving a common institutional identity (although not necessarily a merger), a Joint Office of Aeronautics for implementing joint actions, coordinated operation of facilities for efficiency and economy, and progressive and deliberate creation of inter-dependencies by enhancing specific strengths to build centres of excellence.

An action plan has been proposed to pursue a gradual three stage process of association, partnership and union. This suggests that after concluding an association agreement, a Heads of Establishment Board would be convened together with a Strategy and Coordination Committee with sub-committees on programme, facilities and personnel exchange.

Q5. *In DTI's evidence Mr Charik (Q.78) notes that the DTI operates with respect to the DRA "through the provision of grants" rather than on a "customer-contractor" basis. He goes on to say that "although the distinction seems a subtle one . . . it does affect the tax position considerably". What tax position is affected, and in what way?*

In DTI's evidence Mr Charik was referring to the position on VAT as it relates to the funding of research at the DRA. The question of supply is central to the determination of liability for VAT, that is whether or not there is a supply of goods or services. HM Customs and Excise have ruled that the DTI funding for research at the DRA is not in consideration for a supply to the Department and therefore outside the scope of the tax. Thus, strictly speaking, the relationship between the DTI and the DRA is not that of a customer and a supplier.

Q6. *With reference to Q.86, apart from LINK, are there other examples of how the stipulation that MoD can only spend money on research programmes directly relevant to defence requirements has affected scope for collaboration between DTI and MoD?*

The requirement for a research project to be directly relevant to MoD's needs is significant. DTI will support research which leads to the development of improved "Tools for the Trade", MoD will not. As an example AIMS is a specific project supported by DTI within CARAD where MoD declined to support.

MoD collaboration with DTI is relatively rare, as the following figures for project numbers illustrate:

EUREKA

MoD (DRA) participate in 1 of the 150 (approximately) current United Kingdom projects.

JFIT (JOINT FRAMEWORK FOR INFORMATION TECHNOLOGY)[1]

MoD (DRA) participates in 16 of the 522 current projects under the JFIT initiative. Most JFIT projects are run within one of the Advanced Technology Programmes (ATPs).[1] It follows, therefore, that DRA participation in the ATP initiative is comparable to its participation in JFIT.

Q7. *Would the DTI like a closer connection with the DRA, and do they consider that the DRA should have a supplementary duty towards wealth creation?*

For many years, DTI has had close working relations with the DRA. Since the White Paper "Realising our Potential" the relationship has strengthened. In addition to the long standing arrangements under the CARAD budget, DTI is now working closely with the DRA on a number of wealth creation initiatives. For example, the DRA and DTI are examining how the DTI can become involved in the DRA's Dual Use Technology Centre in Structural Materials.

It is DTI's perception that, following the White Paper, the DRA has taken wealth creation seriously. DRA staff were receptive to the importance of competitiveness and innovation when a presentation was made to them by DTI Officials. DRA staff, and indeed their colleagues within the MoD, are aware that the defence budget depends critically on a strong and competitive UK economy. A senior member of the DRA has been appointed to take forward a portfolio of wealth creating initiatives. DTI Officials are working closely with him and his staff.

Memorandum from Dowty Aerospace Europe

Dowty Aerospace is glad to be able to submit the following evidence to the House of Lords Select Committee on Science and Technology, in response to Mr Batt's letter dated 22 November. By way of introduction it is worth making two points.

1. The level of work carried out by Dowty companies for the DRA and its predecessor Research Establishments has decreased very considerably in recent years due to cuts in defence expenditure. Due to various acquisitions and disposals of companies it is unfortunately very difficult to extract any accurate figures but as a rough order of magnitude it is our judgement that DRA sponsored activity is probably less than one quarter of what it was 10 years ago.

2. The nature of Dowty's involvement in research has fluctuated over recent years. At various times the company has been involved in a range of genuine basic and applied research activities, whereas the current remaining products are less dependent upon this type of work. In its core landing gear, propellers, engine

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[1] These are joint DTI/SERC programmes.

rings and other aircraft actuation and hydraulics businesses, the company is now much more involved in the application and development of new technologies rather than pure research.

Turning to the questions posed:

The Defence Research Agency and its relationship with the MoD

From our perspective the DRA is not independent of the MoD in any significant way. Our understanding of its currently stated role, which is slightly different from that posed, is that it is primarily to provide advice to its MoD customers about the technologies that are needed and affordable to fulfil the staff targets and requirements which the armed forces foresee they will need to meet predicted threats in the years ahead.

A secondary role of the DRA is to carry out a budgeted level of "blue sky" research where there is no specific requirement, and where their customer is the MoD's Chief Scientific Adviser.

The recent creation of the DRA has affected its research strategy but it is not clear to us that its agency status has had any effect other than to seek to eliminate a considerable amount of duplication of activity and to re-define its mission as above.

The DRA has sought to reassure industry that its new status and objectives will not conflict with industry nor provide unnecessary competition. It is frankly too early for an informed judgement to be made on this. However with a declining defence research and development expenditure budget, and the DRA being the first port of call for the decision on where this budget is spent, it is only natural that industry will expect the DRA to carry out as much of this work internally with its own resources before placing contracts on industry. Furthermore the selection of a contractor between tenders from private industry and Government owned agencies will inevitably be a difficult process.

The DRA's declared primary role as above may be detrimental to the long term as it could lead to a concentration on relatively short term requirements. The success of various current projects both at home and in export sales depend entirely on seed corn research many years ago. There is much concern that the latter is declining with long term detrimental results.

DRA Strategy

It would appear that the DRA believes it has a newly defined mission as described above. It is relatively straightforward for the DRA to pursue this mission without being substantially affected by any new thinking about defence and foreign policy following the end of the Cold War.

Whether this strategy is the correct one for the Government to follow is open to question. In the first place the new process is likely to result in significant cuts in research and development spending, just at a time when other countries such as the USA, Japan and France are maintaining and even increasing their R&D spend, despite substantial overall cuts in their defence budgets.

Secondly, and just as importantly, there is the question of dual use Research and Development. Although on the one hand it is disappointing that the Government has not taken the opportunity of giving the DRA responsibility for the promotion of dual use Research and Development, it appears that the DRA are in fact establishing Dual Use Technology Centres, which is encouraging. However the level of funding is likely to be small and the commitment of the Government overall, uncertain. If there was one point which Dowty would like to stress above all in its evidence to the Select Committee, it is the concern felt by Industry that there is still inadequate liaison and policy agreement between HMG and Industry regarding the future technologies which need to be nurtured in the UK by both the Defence and Civil Communities.

The DRA's resources and capabilities should be viewed as part of the UK's total research base and not just as part of the Ministry of Defence. A greater attempt should be made to treat the UK's research expenditure with a cross-Departmental approach. It is recognised that this is a complex and difficult problem but there should be a closer linkage between MoD research and the wider national interest. The attitude of the MoD that "it is not our responsibility to support British Industry" may be politically correct during competitive tendering, but other Western Defence Ministries all regard the health of their own home defence industry as an essential part of their overall defence and security policy. Nor does HMG ever give the impression that they have fully taken into account other underlying economic factors such as tax revenue, the balance of payments, and the unemployment consequences of their actions.

The DRA's Management, Internal Affairs and Corporate Strategy

Dowty has little comment to make on the current internal restructuring of the DRA and its effect upon quality and administration. The first year of the Pathfinder scheme has been disappointing to Industry with regard to the number of proposals accepted and the funding of projects.

The DRA's Relations with Industry, Europe and the Wider World

Much more can and should be done to link the DRA with civilian projects and its linkages with DTI can almost certainly be strengthened. For example a pro-active approach by the DRA towards the National Strategy Technology Acquisition Plan put forward by the Aviation Committee (a joint committee between

DTI and the Aerospace Industry) might have produced a more positive reaction than the lack of any real action so far emerging from the DTI.

There is certainly no evidence yet that the DRA has filled the void left by the demise of Defence Technology Enterprises and it remains to be seen whether the DRA is more likely to succeed where the DTE failed. They are certainly reactive rather than pro-active in this process.

During the 1980's the DTI's lack of support for manufacturing industry, despite being the Government Department responsible for the health of the defence industry, meant that the three-cornered liaison which should exist between DTI/MoD and Industry was virtually non-existent. From recent changes in personnel there is evidence of an intention to improve this situation and this is welcomed.

It has been paraphrased elsewhere that "the DTI has the mandate to support UK Industry but no money, whilst the MoD has the money but no mandate to support UK Industry. If the involvement in dual use technology is merely a means of both MoD and DTI reducing costs, then it will fail. There is a need for MoD to change its attitude towards supporting UK Industry and for the DTI to be in a position to provide its share of the funding". Dowty agrees with this.

An agreed technology policy between all three parties however, is a sophisticated issue which cannot be left to market forces and competition. Above all an active dialogue needs to be pursued between the three parties in a true spirit of partnership.

Letter from Electronic Data Systems Ltd (EDS)

Thank you for your letter of 22nd November addressed to Mr Swinstead of SD-Scicon seeking evidence for the enquiry into the DRA. We are happy to oblige. This letter outlines the extent of our relationship with the DRA which may be of interest to you and the attachment contains the formal response to a selected subset of the questions raised in the call for evidence.

Electronic Data Systems (EDS) acquired SD-Scicon plc in 1991 and, since the formal merger of the two companies in 1992, is now the focus for all of its defence business, in particular its relationship with the Defence Research Agency (DRA). The company has been associated with the DRA and its predecessor organisations for over 25 years. This relationship has been, and still is, primarily one of EDS as a supplier of scientific, technical and management consultancy skills although there is a slow but recognisable trend towards EDS being a customer for DRA skills and services, principally in satisfying other MoD requirements. In 1992 our revenue from business directly for the DRA was approximately £6m and, although accurate data is not yet available, I expect the figures for 1993 to be similar. At any one time we have of the order of 120 staff working on approximately 50 contracts which are spread broadly across most of the DRA's business sectors.

The majority of our work is performed on the DRA's premises and we have a significant presence at all major sites. We believe we have a close and strong working relationship with the DRA's technical staff. These factors provide us with a good insight of some of the workings of the DRA and provide the basis for many of the comments given in our response to the questions raised in the call for evidence.

I trust you find this information useful but should you require elaboration then please do not hesitate to contact me.

Our responses to a selected subset of the questions identified in the call for evidence are given below.

1.1 *How independent of the MoD is the DRA?*

The DRA, in all but name, is still an integral part of the MoD. The perception of the strength of the relationship varies. Senior DRA and MoD staff probably see the greatest degree of independence through the trading fund status and all the freedoms and responsibilities it implies. More junior staff, in our opinion, still equate the DRA with MoD and vice versa. Industry's view is likely to be dominated by the fact that the vast majority of the DRA's income is from the MoD and any organisation which is so dependent on one customer cannot be too independently minded.

1.4 *How has the MoD's system of Research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards trading Fund Status?*

Research Package management is a sound approach to what could otherwise be a complicated and confusing process. The one feature which stands out to an industry observer is that the package managers are employees of the DRA and are based (reasonably) at DRA sites. This does not provide a perfect fit with the increased independence of the DRA from the rest of the MoD or with the prospect of primary or secondary competitions between the DRA and industry for the whole or elements of each package.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

There has been a discernable tendency, since the launch of the DRA and its subsequent desire to be more commercially minded, for DRA staff to be less open about their interests and activities. This may not be true for the whole of industry as we have heard from a number of DRA sources that systems/software houses such as EDS are seen as natural competitors whilst hardware houses are viewed as potential collaborators.

Such commercial awareness has obvious advantages for the DRA itself but, possibly, is not in the best interests of UK Ltd especially when the DRA is the recipient of large amounts of public funding which should be exploited to the maximum possible extent.

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting-up of the agency?*

If the scope of this question can be extended to "restructuring and rationalisation" then, from industry's point of view we would encourage as speedy a transition as possible once the new modus operandi have been identified (through careful analysis and planning). Delays induce uncertainty which can easily result in confusion. Once the final structure is recognised industry, although it may not like it, can quickly adapt to it.

2.4 *Pathfinder—Is the programme worthwhile? If so, does it need refining and how can it be improved?*

From our point of view Pathfinder is an exciting prospect. Of the 170 or so staff who either are working, or are available to work, on DRA contracts over 95 per cent have bachelor degrees, usually in a numeric discipline, with approximately a third of these having higher degrees of one form or another. Consequently, we have a wealth of ideas generating, problem solving individuals who are used to working in a commercial environment. Having the opportunity to influence the direction of the MoD's research programme is a bonus compared with the normal process of responding to invitations to tender based on other peoples ideas.

During the 1992 Pathfinder process we submitted 12 proposals of which one has been accepted and is already underway while two or three of the remainder have been declared of interest and are being considered for contract action. The one success so far is pleasing because it has helped us to move into a new technology which has enormous potential for defence and other applications but which we would have found very difficult to finance solely from our own resources. Should we wind up with three or, possibly, four contracts then the process will be considered to have been a great success.

We treated the 1992 round as a learning process and we are approaching the 1993 programme with equal, if not greater, vigour. A more detailed review of the programme's benefits will be undertaken once the results of our submissions are known.

The one disappointing feature of the process is the length of time between idea generation and contract award. Currently, ideas are formulated following the Pathfinder presentations in November and before the proposal submission in January. Normal contract action is not before the April of the following year, some sixteen months after the start of the process. In some technologies the rate of progress is such that novel ideas are relative "old hat" twelve months later. Undoubtedly, this delay must lose the UK a competitive edge from time to time.

3.1 *Is enough being done to link the DRA's defence orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?*

The primary driver for the DRA's research programme should always be the UK's defence needs. Civilian spin-offs should only be considered, if at all, at a secondary level. It is diffcult to believe that the DRA being staffed with defence experts is the most suitable organisation to decide which areas of research have the greatest potential for civilian spin-off.

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

First of all there is a need for a sound understanding of the particular part of the civil sector to which the technology is to be transferred. To regard the world as being made up of a defence and civil sector is too simplistic. The civil sector is much more complex and research that may be appropriate for one element may not be so for another.

Secondly, there is a need for a degree of openness which is not normally associated with the defence sector. Details of the basics of the research must be available to interested parties at a sufficiently early time to be of benefit to the requirements.

Put simply it is not really the business of the defence sector to push its research to the outside world; rather the outside world should pull in whatever defence technology it considers appropriate to its requirements.

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

Competition is increasingly between groups of companies rather than individual entities. Our experience is that the DRA finds it difficult to team with just one organisation; it appears to feel that, as a public body, it should offer its services to all interested parties. We have even experienced circumstances where staff from elsewhere in the MoD have counselled the DRA against becoming too close to any one part of industry. If there is to be competition then it should be full and free, partnerships will be created as and when necessary and the DRA must be viewed in these instances as an equal to all other competitors, no more and no less.

Memorandum from FR Group PLC

1. THE DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH THE MoD

1.1 Seen from our perspective the DRA does not appear to have a significant level of independence from the Ministry of Defence.

1.2 The DRA's trading fund status appears to have made it a slightly leaner organisation, but it would be hard to argue that this change has assisted its ability to improve the quality of its research.

1.3 We are of the view that the driver for DRA activity continues to come largely from the operational research and operational studies groups in MoD, regardless of its new status.

1.5 Increased competition with private industry, rather than improved technical collaboration, is already developing. For example, DRA had an exhibition stand at the Defence Show selling test gear. DRA Malvern are currently recruiting a significant number of sales staff. We would expect further competition with industry to develop.

3. THE DRA'S RELATIONS WITH INDUSTRY, EUROPE AND THE WIDER WORLD

3.1 & 3.2 Currently there is inadequate linkage between DRA defence concern and civilian spin-off potential. Unless and until technologies can be shared between DRA and private industry, with clear rules on IRP, this situation will prevail.

3.4 From our perspective it is too early to tell whether the DRA will have any real role in the DTI LINK scheme.

3.5 In our view the central issue is whether or not MoD can or will continue to identify and support the sort of R&D tasks that hitherto have been the life blood of the DRA. An American customer of ours has told us recently that he sees no point in visiting RAe Farnborough again because in his view there are now insufficient advanced projects being worked on. This he felt was a direct consequence of the MoD's lack of programmes and lack of programme funding. He has concluded that the sort of money now required for high technology R&D was not likely to be provided to DRA.

3.5 & 3.6 In the absence of an overall UK technology plan it is difficult to see what DRA's role should be. Industry will continue to use its funds in whatever way it thinks will maximise its returns. This is likely to result in it putting money into developing in-house capabilities rather than spend money with DRA who may not have an adequate budget to maintain world class facilities.

3.7 We would very much support more emphasis being placed on dual-use research in DRA to extract the best value for money from this very expensive organisation. As with our response to 3.1 and 3.2 we believe it is essential to establish a positive commercial framework to realise non-military developments.

3.8 As currently contemplated there is every prospect of competition between DRA and private industry and there is certainly scope for conflicts of interest and unfair competition. It is absolutely clear that DRA remain very close to MoD in a variety of ways and is not exposed to the commercial pressures that industry faces.

3.11 The management of defence and more general research in other countries is becoming quite well understood. Examples were given in earlier evidence to the Select Committee on Trade's review of the aerospace industry. We would draw the Committee's attention to the manner in which the US Government uses agencies such as DARPA/ARPA and the way in which the French Government supports its R&D fraternity.

Letter from Sir John Fairclough

I am replying to your letter of 23rd November inviting my comments of the planned review of the Defence Research Agency (DRA). When I was Chief Scientific Adviser, Cabinet Office I worked closely with Sir Donald Spiers who, at that time, was responsible to Sir Peter Levine for the Ministry of Defence Research Establishments. It was Donald Spiers' initiative that led to the proposal and subsequent implementation of the DRA. For my part I proposed, together with the "Next Steps" office, that all the other government research establishments should be considered as potential research agencies and that appropriate customer supplier relationships be set up. The operating principles, eventually established, were intended to provide a framework for all the government controlled research establishments including the DRA.

I have not had any reason to become associated with the DRA since it was set up and so I feel unable to offer you any evidence. I have reviewed your questions and would suggest that additionally an assessment of the scientific and technical vitality of the DRA should be made. One fear, when we formulated the Research Agency proposal, was the danger that their work would become short term and they would lose the ability to engage in strategic research. To overcome this potential difficulty we established the principle that an agency should recover a small overhead on their customer work for the purpose of funding strategic research in areas important to their future. I have reason to believe that this principle was not universally applied because of departmental objections and this would give me ground for concern that the vitality of the establishments have not been developed.

Dr Ian Downing was the member of my staff in the Cabinet Office who dealt with the research agency proposal and he can now be found in the Department of Trade and Industry. I recommend you contact him for the names of the appropriate people in the "Next Steps" organisation who dealt with this project. Peter Kemp, who was the Permanent Secretary responsible at the time, was very much involved with the project and his insight could be of value to their Lordships. But probably the most valuable assessment would come from Sir Donald Spiers.

I hope you find the above helpful.

Memorandum from Dr J E Field FRS OBE

My position is that of an academic who over the last 30 years has had a succession of MoD/DRA research contracts and has served on various MoD committees. Currently, I am on the Council of the DSAC (Defence Scientific Advisory Council), and the LTB (Land Technology Board). I am one of the academic advisors for the SRC (Strategic Research Committee) and am Chairman of the EMRC (Energetic Materials Research Committee). Other independent members of the EMRC have helped compile the following response.

1.1 Not very—the MoD "buys" at least 90 per cent of the DRA output and such a dominant customer exerts enormous influence.

1.2 A help—currently not as much as it might be because a great deal of potential finance management freedoms have not yet worked through (notably ability to carry over money between financial years).

1.3 It has diminished the influence the research establishments (which now form the DRA) have on research strategy. All individual programmes have to be separately approved and funded and it is now very difficult for DRA to control the balance of research activity.

1.4 Not able to comment.

1.5 Probably very little. Industry was initially very nervous about DRA commercial attitudes but it now seems to be generally accepted that an essential role for the DRA is that of being an independent advisor and arbiter on scientific and technical matters to MoD(PE), and as such it has to reach an accommodation with industry and stay out of design, development and production save where industry cannot, or will not, provide.

1.6 Considerable. A UK posture of support and participation in international peace keeping/intervention activities on a world-wide basis has important implications for the build standards and storage/operational environmental conditions for equipments, as compared with limitation of interest to defence of territory in Central Europe only.

Diminishing resources are rendering it impossible for the UK to sustain independent expert/intelligent customer status across the board. There will have to be greater selectivity in sustaining centres of expertise and greater reliance on commercial expertise or, preferably, on international Government centres.

As far as the UK is concerned, future developments in terrorism should not cause much change. UK has an extensive anti-terrorism capability and supporting research and development activity. This does however need to be sustained which will cause pressures elsewhere as total resources diminish.

1.7 The DRA establishments have, traditionally, provided important "quick-response" support in emergencies. It must continue to do this for the Armed Services (albeit the need should diminish if the Services are provided with equipments which are genuinely fit for world-wide deployment—see 1.6). The Security Services and other anti-terrorist organisations (Home Office, Police, etc) will need specialist support. Essentially no change, except that advent of world-wide capable equipment would decrease the need for emergency services to the Armed Forces.

2.1 In principle change should improve efficiency and sustain excellence—but see 2.2.

2.2 Rationalisation and reorganisation should proceed at all possible speed towards a stable, efficient configuration. Drawn out change, or threat of it, is very demoralising to staff. Better to get it done quickly—but that assumes that a target configuration exists. At the moment the DRA does not seem to have made up its mind what it should look like and is experimenting with different organisational structures. That is extremely demoralising to the staff involved.

2.3 Freedoms are valuable for retention of specialist staff. DRA is attracting high quality staff—retention is going to be the problem, especially if the economy recovers well and industry sets out to attract the best people. Shedding the least effective and unadaptable never was easy. With the advent of performance pay and redundancy schemes it is easier but it would still pay DRA to be more selective in choosing its people by greater rigour in assessment during probationary periods, by short term contract employment, initial employment on a consultancy basis, etc—any device to bring about a thorough assessment before entering into a long term employment agreement.

At times when the employment situation was better and Industry actively recruiting, the MoD/DRA frequently had a problem in the length of time it took to make an offer compared with Industry (time to make a security clearance etc).

2.4 It appears to be a good scheme. My experience of it is too limited to make worthwhile comments.

2.5 Strategically, through operational analysis. At technology level DRA needs to be an active participant in international information and collaborative research arrangements (TTCP, IEPC, etc) and also to sustain specialist industrial/academic advisory bodies (for example, DSAC, etc) at national level.

3.1 Civilian spin-off should not be a major factor in deciding the direction of DRA research. However, the product of research should be assessed for potential civil application. (If product is exposed to national industrial/academic advisory bodies this should happen anyway—see 2.5). From my experience the MoD Strategic Research Committee (SRC) for which I'm an academic adviser actively monitors (and encourages) pull through to Industry.

3.2 Once an opportunity has been identified (see 3.1) all that is needed is the will to make it happen—that usually means expenditure of DRA resources. In some areas of research the MoD/DRA and industry are very closely linked, for example, aircraft engines (DRA, Farnborough), electronics (DRA, Malvern), energetic materials (DRA, Fort Halstead). In other areas, the links between the DRA and Industry are poor, partly because of lack of knowledge; though outside Advisors can help here. Industry is often reluctant to use venture capital. My feelings are that tax incentives to help the transfer of technology would help.

3.3 Not able to comment.

3.4 Not able to comment.

3.5 No and no—unless there is allocation of funding to support assessment of defence research product for civil application—see 2.5 and 3.1

3.6 Not able to comment.

3.7 See 3.1.

3.8 See 1.5.

3.9 Not able to comment.

3.10 Not able to comment.

3.11 Probably; I doubt the UK has a monopoly of excellence in this area. Examination of how smaller countries (for example, The Netherlands, Sweden) operate would be worthwhile.

GENERAL

1. In restructuring and down-sizing the DRA concentrated on reducing staff in the administrative/financial/support areas in order to sustain the body of scientists and engineers who, after all, are the producers of the saleable product. Entirely laudable but the net result of cutting the "tail" staff has been a substantial devolution of management work to the grade 7 scientists and engineers, the most experienced and generally the best contributors to the product output. It is a very common current complaint from the productive grade 7s that they now have very little time to do any science or engineering, spending a very great deal of their time making cases for programmes, dealing with staff, facilities and finance matters and reporting on progress. The latest reorganisation in DRA will hopefully redress the balance. However one freedom that research units need is that to choose their own total staffing structure including numbers of "tail" staff, to get the balance right. There is also too much detailed reporting.

2. The management of finances still remains particularly cumbersome with excessive delays in placing contracts. My own experience of this is with grants/contracts for research in Universities. To get the contracts in place invariably requires considerable time spent by the DRA scientists and the academic supervisors to the detriment of the time available for research (see also (1)). The end of a financial year is becoming particularly demanding since the finances now operate in two steps, ie from MoD to DRA and then DRA to the University and each stage takes a few weeks to clear invoices. To give a specific example. A University has the promise of a six month contract due to start 1 October 1993 and end 31 March 1994. Despite the paperwork starting in June 1993 and much time spent "chasing" the paperwork, the official Contract only arrives in late December. There is then a request for DRA to have all invoices by the end of January 1994 so that MoD can have everything passed to them by the end of February to have the "spend" completed by 31 March.

For successful research, the key scientists in the DRA, Industry and Universities need to have their research time maximised and not eroded by excessive paperwork. The restructuring of the DRA should have this as one of its key objectives.

Memorandum from Sir Colin Fielding Kt, CB

1. EXECUTIVE SUMMARY

1.1 Evidence is submitted to Sub-Committee II under the following headings:

(a) relationships with MoD, the defence industry, the US Department of Defense and NATO Europe;

(b) provision of services to other Government Departments;

(c) transfer of defence technology to civil industry.

1.2 Reference is made to the valuable relationships which existed between the Defence Research Establishments (DREs), prior to the creation of the DRA, and the Defence staffs in MoD, the defence industry, the US Department of Defense, the NATO Defence Research Group, and the defence research bodies of the key European nations.

1.3 Concern is expressed that the change of Agency status, while being important and timely in most respects, will herald a transition to a more arms-length relationship with MoD and government generally, coupled with a more broadly-based commercial approach to the execution of defence research which might impact adversely on defence capabilities.

1.4 It is argued that these relationships are perhaps even more important in this changing world, and therefore they should be protected as far as possible, given the constraints arising from Agency status.

1.5 In the past, the DREs have carried out research and related work for a number of government departments including DTI and DoT as well as the CAA. This was taken on because the work was technologically close to defence, using common ideas and techniques. It is suggested that this should continue because it makes economic sense nationally.

1.6 An indication is given of the fundamental lessons learned from the difficulties experienced by Defence Technology Enterprises Ltd in transferring technology to civil companies. It is suggested that transfer of defence technology is important, and a way ahead for the future is suggested.

2. RELATIONSHIPS WITH MOD, THE DEFENCE INDUSTRY, THE US DEPARTMENT OF DEFENSE AND EUROPE.

2.1 The Defence Research Agency (DRA) was created by bringing together the four non-nuclear MoD research establishments and rationalising them into a single business unit. The expectations from this re-organisation would appear to be:

(1) the evolvement of more formal contractual relationships with its primary customers in Defence thereby emulating the financial and operational controls which are customary in private businesses;

(2) the use of a trading fund arrangement to provide for flexibility in dealing with a broader range of customers and programmes within the broad remit of Defence;

(3) to take advantage of the consequential decoupling of the DRA from what might be seen as the constraining bureaucracy of central government, in order to develop a more effective structure and purpose for the new organisation.

2.2 Overall, this has to be seen as a proper and timely objective, but I sense that Agency status, pursued in its wider context, could create disadvantages to Defence in terms of relationships with MoD, industry and the wider world, largely Europe and the USA. The purpose of this note is to provide a personal perspective of my concern.

2.3 In retrospect, one might have expected that the progression to Agency status would cause problems with these relationships, not least because they had been developed to an effective level over more than two decades with the (then) Defence Research Establishments (DREs), who were organisationally an integral part of the MoD and hence government. That perception, coupled with the fact that there was no hint of any conflict of interest commercially, meant that key people in the DREs held a position of unique trust in relation to information exchanges derived from a wide constituency, which was of considerable value to Defence.

2.4 In the following paragraphs, it is intended to examine the nature of some of these relationships with MoD, the defence industries and USA/Europe as follows:

The Ministry of Defence

2.5 Historically, there has always been a close interaction with the Defence staffs related to future operational requirements (ORs) for new equipments. It was driven by the continuous need for advice by the staffs about the art of the possible in technological terms, in relation to future OR's. This led frequently to the need for detailed studies by the scientific staffs. As a result, defence scientists and engineers developed a rounded knowledge and understanding of that part of the defence process. The defence industries do not have that privilege, nor could they have it, because any one company is unlikely to possess the scope of defence knowledge and understanding to provide an alternative source of advice.

2.6 The DRA are the proper organisation to continue this relationsip, but it may be found that the formal customer/contractor arrangements in force generally with the MoD will create a more arms length connection with the Defence staffs, which could stand in the way of the continuity of informal discussions deriving from good relationships, which characterised the previous linkages. Confidentiality and security issues may arise too because of the quasi-independence of the DRA.

The Defence Industry

2.7 A very important facet of the workings of the DREs was the very open relationships between their research programmes, and corresponding programmes in the defence industry, whether private venture or government funded. The principal reason for this was because they were not competitors, and confidentiality was generally well-protected anyway by DRE staff; and understood by industry to be so. In consequence, the DREs had a comprehensive understanding of the thrust of virtually all defence industry research and development, regardless of any perceived match to defence programmes. They valued an understanding by Defence of their work, not least because they hoped to secure some interest by Defence in its exploitation. For the DREs' part, this understanding was critical to their judgements about MoD funded R&D placed with the defence industry; and assessments of industrial capabilities in relation to future studies and equipment procurement.

2.8 The DRA may have difficulty in reaching the same accommodation with those industries into the future, without the tedium of confidentiality agreements on the grand scale.

The Department of Defense in the USA

2.9 Fruitful technical exchanges in Defence science and technology between USA and UK (putting aside nuclear) are necessarily constrained by the sensitivities of commercial considerations. It is noteworthy however that formal collaborative arrangements for such exchanges has existed for over 20 years, involving Canada, Australia, New Zealand and the UK. These were conducted on a government-to-government basis.

2.10 As might be expected, they had varying success over a period of years, but they were an important vehicle for establishing bilateral exchanges which were of much greater importance. They were led by the Director of Research and Engineering in the DoD on the US side, and so it did not lack authority. I found it most valuable when I was UK leader during the 80's, and my experience was that the UK gained a respect (and access to the US product) out of all proportion to the costings of our respective research programmes.

2.11 Similar arrangements existed symmetrically in Europe through the medium of the NATO Defence Research Group: there were also a number of primary bilaterals with France, Germany, Netherlands and Italy, all of these again on a government-to-government basis.

Conclusion

2.12 It has been shown that valuable relationships have been developed over very many years by the forerunner of the DRA, ie the Defence Research Establishments regime, with

(1) the Defence staffs in the central MoD;

(2) the Defence Industry;

(3) the Department of Defense, USA;

(4) NATO and the key European countries.

2.13 The transition to a more arms-length relationship with MoD and government generally, coupled with a more broadly-based commercial approach to the execution of defence research, stemming from the change to Agency status, might well impact adversely on the advantageous relationships set out above. Defence capabilities could be adversely affected by any consequential reduction in the flow of valuable information gained in fact, from a marginal use of manpower.

2.14 There is another less quantifiable aspect derived from the close working relationships with Defence staffs, and that is that the rounded knowledge of defence generated in key defence scientists and engineers is a primary reason why the DRE's were able to play a unique role in both the Falklands and Gulf conflicts. Problems could be quickly indentified and understood, working alongside operational staffs, and solutions put in hand in the right quarters.

2.15 It is arguable that these relationships are important, bearing in mind their marginal cost, and should be protected as far as possible, given the constraints arising from Agency status.

3. Provision of Services to other Government Departments

3.1 In general, the criterion for carrying out work for other departments was the existence of suitable expertise, stemming from the fact that many defence technologies and sub-systems had a direct read across to civil programmes eg radar, command and control etc.

3.2 The DREs carried out work for DTI in areas like aeronautics and information technology, where there was scope for defence applications as well as civil—in fact about 8 per cent of the research programme was directed and funded by DTI during that period. Other work was carried out for CAA eg on air traffic control and related matters; and for the DoT on ship control in congested waters. For the DRA, the same rationale should apply—it makes sense nationally for the work to be done this way.

4. Exploiting Defence Technology for Civil Use

4.1 The setting up of Defence Technology Enterprises Ltd in 1984 was intended to facilitate the flow of technology from the MoD Research Establishments to civil industry on a substantial scale. The company was founded with financial backing from a number of banks and finance houses. Technology indentification and extraction teams (known as "ferreting") were positioned in the key Research Establishments with the cooperation of the MoD. The "ferrets" were responsible also for identifying sales opportunities across a very wide civil industrial base.

4.2 In hindsight, it is clear that the company tried to do too much too soon in responding to the perceived expectations of the defence community. It ran into severe negative cash flow problems in 1989 and the shareholders, after careful consideration, decided that they were unwilling to finance it further in that form. With their agreement, changes were made to the management and the company was downsized radically to reduce its overhead burden. It was during this difficult period for DTE that the DRA was formed, which introduced an uncertainty about the policy of this new body to defence technology transfer. In the light of this, it was decided not to renew the MoD/DTE agreement (1984) when it came up for review in 1991.

4.3 Importantly, the company was saved by its new management, and is now profitable, but is directed on a more modest rate of growth; a course of action which experience of this field has now been demonstrated to be a proper one.

4.4 At least two fundamental lessons were learned from problems experienced during this period and the background to these is set out below.

(a) The output of Defence research carried out by the research establishments, formerly when they were an integral part of the MoD and now as the DRA, falls a long way short of a developed product. At best it can provide a demonstration of feasibility of a technological concept. Of course, further development for defence purposes is for the particular industries in support of defence to carry out within the scope of the defence equipment procurement programme.

However, if one turns to the matter of civil exploitation of defence research, it is necessary to find companies who are willing to fund that bridging development to create a saleable civil product from the technology base, and this is one of the most difficult features of high technology transfer. Our experience has been that the smaller companies, say less than £20M turnover, have tended to be wary of funding product development, without seeing the feasibility of that particular technology demonstrated in line with their speculative product application. The DRA have no remit to do it, and the technology transfer company (DTE in this case) can do it only on a very selective basis, for it would not normally have an adequate funding base for this role.

In consequence, there is a real problem here which inhibits, and in too many instances can prevent, the smooth transfer of technology to a customer company, which would otherwise be quite receptive. Clearly, validated technology derived from defence research, is not an adequate base in itself for transfer to small and medium-sized companies. Significant further development is needed to field a successful product.

(b) A major problem is how to limit the initial adverse cash flow from a "cold start-up" technology transfer company like DTE operating on the scale that they decided was necessary.

It quickly found that virtually all of its potential customer companies wanted to limit the up-front payment for the technology, in favour of higher royalty payments, which would accumulate significantly only after a lapse of several years. For a start-up company like DTE, it meant that the cost of sales could be expected to lag seriously behind revenue for up to 7/8 years. Self-evidently, it was difficult to obtain enough "patient money" from any source, given that position.

4.5 Clearly, DTE set up a substantial operation for reasons which have already been rehearsed, suffered high negative cash flow, and paid the penalty when the financial climate became tighter. An alternative approach could have been to commence operations on a much smaller scale with the objective of matching revenue against expenditure within a year or so, but the climate of the time would have ensured that that DTE received few plaudits for such a conservative approach.

4.6 Has the DRA effectively filled the void? It has to be said that DTE achieved a marked success in selling a substantial number of licences—where they failed was in not making a profitable business out of it during the period up to 1990. DTE built up a portfolio of the technology needs and markets of possible customer companies across the UK, and the scenarios in which one might expect to sell licences for defence technology to them. That sales base exists in the company today.

4.7 It is not realistic for the DRA to run a technology transfer business because it has neither experience of it, nor a remit to set up such a business within its trading fund operation as I understand it. It has also a high overhead structure to contend with in carrying out operations of intrinsically low profitability.

4.8 Therefore, given the diffculties, it is worth trying to achieve the process of transfer of defence technology to the civil field? My answer would be a firm yes, because the DRA will continue to be a critical source of innovation in technologies which have broader application than just defence. On a national basis, we should attempt to share those on a proper commercial basis with the large range of small to mid-sized companies who cannot afford the luxury of enough high-tech research.

4.9 What are the conditions necessary for the successful transfer of technology from the defence to the civil sector? First, possible technologies need to be identified in a meaningful way within the DRA, and its staff are in the best position to do this. Secondly, there is a need to involve a specialist technology transfer company like DTE, who possess the hard-won knowledge about the likely needs of civil industry and experience of selling technology licences. A critical factor is the matching of the technology to the prospective customer company who has ideas about a product and market requiring that technology.

4.10 A possible arrangements for implementation could be a modest joint venture on a straight commercial basis between the DRA and DTE, who now have the experience to enable them to make the connection to the right companies. Other "DTEs" could be involved as appropriate, but the primary aims should be to prove the effectiveness on a modest scale in the first instance, and the financial viability of the operation.

Memorandum from the GMB

PARAGRAPH 1.6

GMB believes that the Defence Research Agency must retain a competent and viable engineering facility. Experience has demonstrated that the best advice on weapons and technology is that gleaned from those responsible for the design and manufacture of the equipment.

Fault finding is far more difficult if left to contractual labour, unfamiliar with the equipment on which they are working. In-house technicians, working in partnership with scientific staff, are more likely to prove cost effective by detecting faults in design at a much earlier stage in the process.

PARAGRAPH 1.7

The Defence Research Agency and its staff have always placed the highest regard upon playing their role in the defence of the country. This has required the DRA to have the technology, skills and equipment to perform their role effectively.

In recent years, the DRA has undermined the ability to perform this role by reducing the level of skills and equipment. There has been greater reliance on contractors, whose level of training and skill cannot be vouched for and over which the DRA has less control, both in terms of skill level and in terms of quality.

Contractors have proved considerably more expensive. Their first consideration as a private company, borne out of necessity, is profit and not the defence of the country. Our experience of the Falklands War demonstrates this perfectly.

The Government has been extremely reluctant to publicly announce how much the UK still owes to the private contractors engaged during the war. Yet this was no one-off experience. It was repeated again during the Gulf War.

GMB considers this situation to be a national scandal, when private contractors are used to help fight a war in the defence of British nationals (as in the Falklands) and when the Government is too embarassed to announce the level of debt owed to such people.

A properly funded and resourced DRA would have been more cost effective and efficient and GMB urges the Sub-Committee to discover the true costs of funding private contractors and the level of outstanding debt still owed to them, before permitting the DRA to be further undermined.

PARAGRAPH 2.1

The restructuring and rationalisation proposed by the DRA is symptomatic of a malaise in British management generally. Such attempts to operate below capacity with a contractual "top up" will increasingly result in customers going directly to the contractors. As such, we do not believe that the proposed changes will, in any way, assist in saving the DRA.

Instead, quality and training will be undermined and gradually the reputation of the Agency will be ruined, rendering the difference between the DRA and contractors little more than a decision based on cost, rather than one based, as at present, on quality.

In addition, the cutbacks in buildings means that the DRA has lost vital facilities which will make it difficult for the Agency to compete with the private sector, as its capacity is reduced.

Paragraph 2.2

The rationalisation is driven by cost and not based upon the future defence needs of the UK. The DRA proposals will mean that the biggest loss in staff falls within the engineering grades and support services—the very core of a reliable defence system. These staff are among the lowest paid within the Agency.

The proposal to shed staff in these grades follows on the examples of employers throughout British industry and increasingly within the public sector. Such practices, based on a philosophy of managers wishing to manage money rather than people, has failed industries as diverse as shipbuilding, clothing and textiles and construction.

Frequently, the use of contract labour has led to a diminishing of standards and quality and thereby has eroded the ability of the organisation concerned to deliver a service of the highest quality. It is that quality, rather than the raw price, which separates the in-house specialists from the contractors.

Paragraph 2.3

Recruitment and retention of skilled and experienced employees is essential if a viable, quality service is to be provided by the DRA. Far from staffing costs being too expensive, many sites have been forced into paying additions to ensure that staff recruitment and retention is possible.

Where this is not happening, staff are continuing to leave the DRA for more highly paid jobs in the private sector. GMB is increasingly concerned at proposals to introduce Performance Related Pay (PRP) into the Agency.

Surveys where PRP has been introduced indicate that it is being abandoned with a growing frequency. A study by the Institute of Manpower Studies (IMS) found that:

- PRP does not contribute to the motivation of employees and may have a demotivating effect;
- there is little evidence to suggest it helps in staff retention;
- employees are negative, or at best neutral, about such schemes, often feeling they open the way to favouritism and discriminatory pay awards.

For these reasons, private sector employers are rejecting PRP. Experience has shown that it undermines team work and creates unnecessary friction and resentment in the workplace.

GMB can well understand why some may feel it necessary to encourage the devolution of responsibility in establishing pay levels. However, it is important that managers are trained to recognise that the needs of the DRA, based on quality service to customers is not jeopardised by the adoption of discredited payment systems, nor by the proposed rationalisation and restructuring proposals.

Conclusion

In concluding, there are two points in particular which we would wish the Sub-Committee to address. The first, mentioned above, concerns the cost to Britain of the use of private contractors during the Falklands and Gulf Wars. No assessment of the true costs between the retention of an in-house workforce and private contractors can be made without those figures being available to the Sub-Committee.

Second, we invite the Sub-Committee to consider whether the promotion of external contractors is really in the best interests of this country's defence. There is no suggestion in the proposals put forward that contractors should be British. There is nothing to prevent the DRA contracting to overseas companies, or companies with overseas parent companies.

GMB suggests that such a situation, given the equivocation of our allies in the European Union, over the Falklands and Gulf Wars, means that the UK national interest in defence cannot be placed in the hands of overseas contractors. In addition, for the reasons we have outlined at length, we do not believe that quality, or cost effectiveness, can be guaranteed by the increasing use of private contractors in the DRA.

Letter from the Embassy of the Federal Republic of Germany

Please find enclosed:

- A Briefing on the Research and Technology Concept of the Federal Ministry of Defence (FMoD) which was provided by my authorities in Bonn

and

- a List of the staff of three Government-owned Research Institutions

In addition you might be interested to know the "Basically Funded Institutes" indicated in Figure 8 (not printed).

These are:

- Deutsche Forschungsanstalt Für Luft- und Raumfahrt e.V. (DLR).
  This institute is funded by the Federal Ministry for Research and Technology (BMFT), some Länder, some Associations and the FMoD.
- Deutsch-Französisches Forschungsinstitut Saint-Louis, (ISL),
  A French-German-Government Funded (50 per cent—50 per cent) Institute.
- Fraunhofer-Gesellschaft zur Förderung der Angewandten Forschung e.V. (FhG).
  5 of the 30 FhG-Institutes are FMoD-funded (100 per cent).
- Forschungsgemeinschaft für Angewandte Naturwissenschaften e.V.
  (FGAN). FHAN is 100 per cent funded by FMoD.

Since about 1988 funding of these institutes is kept on a nearly constant level; at about 200 million DM; in real terms this means an inflation-related reduction.

The remaining Research- and Technology-money is mainly given to industry which includes

- Marinetechnik Planungsgesellschaft mbH (MTG) in Hamburg

and

- Industriek-Anlagen Betriebsgesellschaft mbH (IABG) in Munich

and to a minor extent to other Research Organisations including Universities.

I hope that this information is of some help for the Select-Committee.

If you want any further information on German Defence Research and Technology please do not hesitate to contact me, I will give answers as far as I am in a position to do so.

January 1994

Briefing on the Research and Technology Concept of the Federal Ministry of Defence

For research and technology we have at present about 685 million DM available, that is, about 6, 7 per cent of the funds programmed for the development, production and maintenance of defence material in the Federal Republic of Germany. A broad brush comparison of our efforts, with those of the United States (the United States makes available 14 or 15 times as much money as we do) shows clearly that these resources do not permit us to pursue the full spectrum of research and technology activities in the necessary depth. So we are forced to concentrate our resources on key areas of research and technology, and we are prepared to accept national technological gaps (and gaps in this connection are technological areas of reduced activity, where we merely seek to maintain our sound judgement of technological trends). Selecting key areas requires a complete understanding of, and information on, the technological threat on the one hand, and research and technology activities under way on the other. Another requirement is for us to take into account, among other things, the close interdependence between

- the conceptual ideas of the armed forces and
- the defence technology potential.

Now a few words about how we are using our budgetary funds and the way to define the key areas of research and technology.

1. The Federal Ministry of Defence does not use the funds available to us to carry out basic research, but rather relies on civilian findings, adapting them to military needs (add-on).
2. All research and technology activities are combined on an inter-service basis, to form one single Research and Technology Concept for the Bundeswehr (Bw).
3. This adds to the military concept of the Bw, the Service Concepts, and the Subconcepts for Inter-service Functions, another, equivalent, concept—the Research and Technology Subconcept.

   This concept describes objectives and sets priorities; it also determines which areas of reduced activity, that is to say gaps, will be accepted. The translation of this concept into current practice is done annually in a Research and Technology Guideline which is included in the Bundeswehr Plan for the respective year and furthermore in the formulation of concrete research and technology programmes.
4. The Research and Technology and Subconcept and its annual up-date are elaborated by the Armaments Directorate, in close consultation with research and industry on the one hand, and in a continuous dialogue with the armed forces on the other.

This dialogue between the technological and military establishments as well as with the civilian side, is sought deliberately with the aim of including in the decision-making process all those who are involved either directly or indirectly.

STRUCTURE

It has proved reasonable to gear research and technology planning more strongly to the date on which expected results are likely to be used. Therefore we structured our planning into two phases.

Planning Phase 1 covers activities aimed at technologies that are

- expected to be introduced into service within 15 planning years.

Technological activities in this phase, will be oriented towards preparations for meeting the requirements for defence material formulated in the current Bundeswehr Plan (15 planning years).

Activities in this period are subsumed under the term "system technology", because the system and items or equipment listed in the Bundeswehr Plan exert a direct influence on the technologies to be made available.

Therefore, technological activities in this period are primarily aimed at

- investigating the technological-economic feasibilty of characteristics laid down in military requirements,
- defining and reducing the development and production risks, and
- early assurance of a sufficient growth potential of systems and items or equipment.

To ensure a capability of flexible response to changes in Bundeswehr planning, technological requirements are not planned in terms of individual systems, but rather in terms of groups of related systems (guiding concepts).

For Example:

- Command and Control information systems
- Communication systems
- Electronic warfare and reconnaissance systems
- Main battle tanks/combat vehicles
- Guided weapons/dispensers
- Surface ships/craft
- Submarines

The second planning phase covers activities aimed at technologies that are expected to be introduced into service in a period of more than 15 planning years.

Regarding objectives of activities oriented towards this period, we speak of future technology and research.

As regards requirements in the long-term planning period, it is essential for us to prepare ourselves flexibly for the future, to feel our way in technology. This is done by activities that

- enhance our prognostic capability,
- establish the prerequisites for providing the development and production capabilities required in the long term,
- probe the relevance of civilian research and technology results for defence technology, and
- improve our capability of developing conceptual alternatives.

For example, the Bundeswehr Concept describes long-term military tasks (for instance, combat operations). In the Research and Technology Subconcept, these military tasks are correlated to "armaments tasks" (for instance, collection and transmission of target data).

The "armament tasks" are subdivided into five functional groups of military requirements:

- Reconnaissance and command and control
- Mobility and transportation
- Employment of weapons and effectiveness of fire
- Protection
- Planning and decision-making aids.

Underlying this structure, there are, of course, many individual actions which permit us to identify and eliminate over-lapping technology activities.

MANAGEMENT

Let me now add a few remarks explaining the essential steps in the process of consultation.

All current research and technology activities and proposals for new activities are discussed in the technical working groups of the Federal Ministry of Defence, dealing with various technological areas and composed of representatives of the Armaments Directorate and the Service Staffs. They discuss research and technology proposals resulting from the dialogue in the Federal Ministry of Defence, a dialogue at international level and a dialogue with industries and research institutes.

In case of activities concerned with systems technology (phase 1) the procedure is as follows:

Where activities are aimed at systems included in the Bundeswehr Plan (systems technology activities), the contributions made to the system concerned by any specific technology are evaluated by the military system officer and the system manager of the Armaments Directorate and by a selected body of experts. The outcome of this evaluation is a priority list of technology activities to be pursued for the purposes of the system concerned (in relation with future battle tanks for instance activities will have to concentrate more on protection than on the undercarriage).

In the case of activities aimed at future technology and research (phase 2) evaluation follows a different procedure.

1. The armaments establishment sets priorities for specific activities related to the task to be accomplished (this is for instance where the decision is made on whether activities in the area of optics/optronics are a more urgent requirement for future target reconnaissance systems than activities concerned with radar).
2. The armed forces provide comments on military tasks. Their evaluation answers for instance the question whether future activities should concentrate more on target reconnaissance or on long-range reconnaissance of the situation.

All evaluation results (those concerned with systems technology and those concerned with future technology) are in turn validated in a collective effort by all concerned and the key areas of activity and if required shifts of effort are finally determined. The outcome is the Research and Technology Guideline and the Research and Technology Program which is promulgated by the Armaments Director of the Defence Technology Directorate.

This is an annually repeated process. In consequence, monitoring of current activities is automatically assured.

TODAY'S RESEARCH AND TECHNOLOGY PRIORITIES

A glance at the R&T *contract* structure for 1992 shows that the total volume of approximately 740 million DM are being spent on activities with shares distributed as follows:

— weapons delivery, weapons effect:	31.3 per cent
— reconnnaissance, command and control:	28.1 per cent
— mobility, transport:	22.9 per cent
— protection:	11.3 per cent
— decision and planning aids:	6.4 per cent

The trend in the last few yeas was marked by an increase for reconnaissance, command and control and protection, while there was a decline in weapons delivery and weapons effect.

It should be pointed out in this context that these considerations compare percentage points. A comparison of R&T expenditures in the past few years shows that they had to be lowered from about 1 billion DM to 685 million DM in the years from 1987 to 1994 so that activites related to the definition and development of future weapons systems could be carried out. This reduction in R&T budget was still possible because such projects as the "fighter 90" and the "anti-tank helicopter 2" were deleted from the R&T field activities during the timeframe. Wavelike movements in annual slices of R&T budget are consequently impossible to avoid, even without a change in external influences.

POSSIBLE R&D PRIORITIES IN THE 90S

At the moment we discuss our R&T-Program for 1995 and without setting any priorities I will now list some of the activities of high importance for the nineties.

Activities in connection with reconnaissance and command and control involve intensive work on new radar sensors, with their special aim being an improvement in reconnaissance performance and resolution power. The activities are complemented by work involving passive optic/optronic sensors. These are related to work on data processing.

Software development and updating procedure and methods are also of continued importance, along with techniques and standards, allowing interoperability between different levels of command and weapons delivery systems.

Weapons delivery weapons effect cover a very broad spectrum of activites, not only in connection with guns, but also with rockets, missiles and dispensers.

For processing large amounts of data on a minimum scale, it will be possible to largely rely on civilian findings in silicon-based micro-electronics, and an add-on program will be sufficient.

A shared priority will continue to be the terminal effect, with activities here including both those regarding kinetic energy-based penetrators for powder guns as well as those regarding future electric guns.

Another shared priority is accorded to protection in the widest sense, ie as well composite armor as lowering detectability in all frequency bands.

Mobility and transport comprise all activities related to ground- and sea-based and airborne carriers or platforms. This includes work on special materials that are only needed in the military sector; it also comprises structures with an extremely high load capacity which are not necessary in the civilian sector. But subsystems such as new, modular avionic architectures for aircraft also belong to this category. Drones are sure to play an increasing role in our considerations for the future.

The findings of studies in the subject fields listed here are a vital prerequisite for our "capability to think and reason" in the widest sense.

Appreciation

I would conclude my remarks by adding a brief summary of these efforts:

- The Research and Technology Concept is an overal concept for the Bundeswehr as a whole, that is to say concepts applying to any of the Services in isolation are out of the question.
- In developing the Research and Technology Concept we have provided a concept which rules out duplication or redundance of development effort and does not permit counterproductive activities either.
- Diverging opinions will result in a "consensus" paper opening the road to compromise.
- This concept permits us to select key areas of activity on an inter-service basis, that is to say it is a concept based on the mutual consent of all concerned.

Memorandum from Keith N Henry, Brown & Root Ltd

1. The Defence Research Agency and its relationship with the MoD

1.1 *How independent of the MoD is the DRA?*

It could be argued that, as a "wholly owned subsidiary" of the MoD, the DRA cannot be independent. Also, the DRA is very dependent on the MoD for its work—it is by far the largest client and will remain so for the foreseeable future.

However, over the last year or two (and particularly since achieving Trading Fund status) the DRA Chief Executive and his team have become increasingly responsible for the management and running of the DRA with little or no involvement from the MoD.

In many ways, the Secretary of State can be considered as the Chairman of the holding company (MoD) and, as such, he would be expected to review annual budgets, plans, capital expenditures and sensitive issues etc, but leave the day to day running to his Chief Executives.

1.2 *Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as provider to the MoD of the best quality research?*

There is no doubt that the Trading Fund status and the commercial awareness that the DRA Executive has introduced has led to a substantial improvement in service and quality. The MoD is now a "customer" who has to agree with the "supplier" (DRA) the scope of work, costs, schedule etc. Targets are established, monitored and expected to be met. This is a *two way responsibility* and the MoD is also under similar pressures to perform. When you visit DRA establishments you very quickly sense enthusiasm rather than resistance to the whole customer/supplier concept.

1.3 *How does the DRA's status affect its research strategy?*

The change in status should not affect its research strategy other than the fact that tighter cost controls are now in place and the available money will be used more effectively. The MoD is the principal customer for research and will continue as the main specifier of research requirements. However, the DRA is an unusually intelligent supplier who in many cases has superior resources than its MoD client. The DRA will improve its performance over time such that it will give increasing value for money, but it is to be hoped that it will always be allowed to keep some resources available for its own initiatives for future research activities.

1.4 *How has the MoD's system of Research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency towards Trading Fund Status?*

Industry generally manages major activity items on a task force basis whereby the work is broken into manageable packages under the responsibility of a project (package) manager. Since time began it has been argued that research was too abstract and too fluid to be managed in a similar way—this is convenient nonsense. Research without proper controls has invariably led to cost and schedule over-runs. The DRA/MoD are implementing package management with much improved results.

It should be noted that "package managers" need to be resourced and trained from within the DRA/MoD, or recruited from industry.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

It is to be hoped that the DRA will establish such a good reputation that other Government departments will either follow the DRA example with their own research departments or, where appropriate, rationalise their departments with the DRA. In any event, there is no doubt that the DRA will have interested observers—over the next few formative years.

Industry has yet to fully understand the changes that have taken place at the DRA and therefore it does not appreciate that opportunities or competition this will bring. In time it can be assumed that industry will see the DRA as a supplier of research, a collaborator and also as a competitor. One of the increasingly important tasks for the DRA Executives is to expand its contacts with industry.

1.6 *How is the process of formulating a strategy for the DRA being affected by the new thinking about defence and foreign policy following the end of the Cold War?*

The post Cold War scenario, together with a deep recession, is leading to a policy of defence cuts. Research is always a vulnerable target. The media would have us believe that even the Secretary of State is not fully in control of his budget and it is therefore hard to see how the DRA has a significant voice in this matter. What the DRA can do is (i) carry out research as cost effectively as possible, (ii) work with the MoD to ensure that only the necessary research is carried out, (iii) recognise that local warfare is now more the trend than global warfare, (iv) make the Secretary of State fully aware of the *real and long term impacts* that further cuts will have on the research programmes and our defence capability.

1.7 *The DRA, like its predecessor organisations, has as its primary role the provision of research services to the MoD. In the past, however, the defence research establishments have also provided other (non-research) scientific and technical services to the MoD (significantly so during the Falklands and Gulf conflicts) as well as to other Government departments and private customers. How far should the DRA continue to provide such services, and to whom?*

Despite the rationalisation programme and appropriate cut backs much of the fundamental technological skills of the DRA ie, scientific resources, will still be in place. Some manufacturing facilities may be lost but, with few exceptions, industry can be called upon for support. Where, in exceptional cases support is not thought to be available and a real need remains, then the DRA should maintain that facility on behalf of the MoD but should be fully reimbursed under a separate "strategic capacity" account. The DRA's general competitiveness should not be penalised by this requirement.

2. THE DRA'S MANAGEMENT, INTERNAL AFFAIRS AND CORPORATE STRATEGY

2.1 *Will planned restructuring and rationalisation affect excellence, or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?*

Much of the restructuring programme has focused on rationalising the number of sites and reducing the number of support staff on the sites. With time and management effort, efficiency will improve and so will quality. In both cases *these are more an attitude of mind* and have little to do with budgets.

It is true to say that if the DRA Executive had not undertaken these programmes the new budgetary challenges would have placed a far greater load on the organisation and the amount of actual research effort achieved would have been substantially reduced.

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting up of the agency?*

The rationalisation of the Defence Research Establishments was long overdue and the DRA is more of a vehicle to create the change, rather than the cause of the change. The MoD's research budget is reducing rapidly and will continue to do so. The DRA has no choice but to act before these reductions occur, rather than after they have taken place. If anything the DRA should discount the MoD's forecast by a further 10 to 15 per cent and act accordingly.

2.3 *What are the implications of the new regime's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best staff? What constraints and freedom surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?*

The DRA is increasingly competing with, and recruiting from, industry. It is therefore essential that it can pay and reward its employees appropriately, particularly at the management levels. The DRA should be free to hire, or dismiss, staff as it feels necessary. Hopefully the DRA will not suffer from the present fallacy of hiring highly (over) paid management consultants whose main merit is that they do not appear on the department's staff numbers.

2.4 *Pathfinder is the DRA's programme to allow private companies to gain access to research at a much earlier stage and to contribute ideas which align with their in-company, possibly civil, research programmes. The projected advantages of Pathfinder include more value for money by prevention of duplication of research and improving take up of promising ideas, and providing companies with the earliest opportunity to develop their ideas thus improving their wealth-creating potential. Is the programme worthwhile? If so, does it need refining and how can it be improved?*

The logic behind the Pathfinder programme is good. As explained in 1.5 above, as the DRA builds up its contacts with industry in a two way dialogue, the DRA will play an increasingly important role in this area. Putting it bluntly though, industry is suffering from an overdose of Government initiatives at a time when mere survival is a high priority. As things improve, those programmes will be far more popular.

2.5 *How does the DRA identify future defence needs, and is its method of identifying such needs properly thought out?*

Largely covered under 1.3 and 1.6 above.

3. The DRA's relations with industry, Europe and the wider world

3.1 *Is enough being done to link the DRA's defence oriented concerns with civilian projects, and should civilian spin off be a major concern for defence research?*

The DRA's business plan shows that a certain amount of civil research is already being carried out and that this is expected to increase. The danger is that nearly all defence related suppliers believe they can switch to commercial work. They only do this when the defence funds run out and usually in a falling market. The gap between defence work and commercial reality is invariably much wider than first perceived. It should also be remembered that the commercial world has survived for many years without the benefit of former defence contractors galloping to the rescue.

Where the DRA has unique skills and there is a market need then they should be given cautious encouragement to pursue civil research.

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

One of the biggest problems of research is spreading the knowledge of what programmes have been undertaken and what opportunities are available. Not surprisingly the research establishments have historically kept much of this knowledge internally. The DRA is aware of the value of this data and with time will be able to review and exploit the intellectual property on behalf of the DRA and MoD.

3.3 *How does the DRA connect to the Technology Foresight exercise being conducted by the OST?*

Insufficient personal knowledge to offer comment.

3.4 *How effective are the DRA's links with the DTI, and is there too little DRA involvement in the DTI's LINK scheme?*

Insufficient personal knowledge to offer comment.

3.5 *Has the DRA effectively filled the void left by the demise of Defence Technology Enterprises, and is the DRA any more likely to succeed where DTE failed?*

The general improvement in commercial awareness and the DRA's mission to run as a business will create a much more aggressive desire to exploit relevant technologies.

3.6 *What is to be the DRA's role in the issues of conversion and diversification in the defence industry as a whole?*

Largely covered under 3.1—the DRA should concentrate on its own conversion and diversification problems before they worry about anyone else. It would be easy and tempting to dilute their limited resources.

3.7 *How should it relate to the part of industry which is not concerned with defence and how much should it focus on dual-use research?*

Largely covered above.

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

The DRA has set itself the challenge of having much of its future revenue won by competition. They recognise that conflicts will occur—perceived or otherwise. Fair and impartial bidding procedure will always have to be open to scrutiny to achieve acceptance by industry. Independent review teams will be required.

3.9 *What kind of relationship exists with the EC Framework Programme and other European (including non-EC) programmes, such as EUCLID and EUREKA?*

Insufficient personal knowledge to offer comment.

3.10 *Does the DRA seek European collaboration as a matter of course?*

Co-operation on research with any overseas country should be encouraged, subject to security interests and commercial factors.

3.11 *Is there in other countries anything relating to the management of defence research from which the United Kingdom could learn?*

This subject is dealt with at some length by Mr Waldegrave's OST White Paper and the DRA should certainly feel free to take part in the initiatives outlined.

Memorandum from R. Hughes, Ferranti-Thomson Sonar Systems UK Ltd

GENERAL COMMENT

The origins of the DRA lie in the often extremely successful Government Research Establishments such as Malvern, Farnborough, etc. Although necessarily secretive and generally bureaucratic, a great deal of advanced technology has been developed in what is now the Defence Research Agency. It was developed under a financially benign regime in which money was available to fund advanced technology developments. When the "Limit of Financial Liability" was reached, the research group involved would apply for more funds with a more than reasonable chance of securing the extra funding to continue the project.

As we all know, both the ideological and commercial climates have changed out of all recognition in recent years. The DRA has to be more responsive to and controlled by market conditions. The management task which is faced by the DRA boards is formidable. If the DRA is to maintain technical excellence, establish a position in its market and eventually produce profits, then I believe that it will have to undergo a complete cultural metamorphosis in most of its areas of activity. Specifically, I think that the following aspects of the DRA organisation need to be addressed immediately.

1. *Marketing*

Most Government employees have little or no experience of this vital and basic function of a commercial organisation. It had not been necessary under the original establishment structure. Before trying to actually sell its wares, DRA must have short and medium term plans which will enshrine a clear, simple and easily understood marketing policy which needs to be communicated to every employee of the DRA. Marketing is not confined to one department, it is a way of thinking and behaving which will ensure that DRA knows and respects its customers and knows how to supply those customers' needs. This needs a high level of marketing direction from a senior manager, probably from the defence or related high technology industry, who can command the respect of colleagues within the DRA as well as from customers and future customers with whom he must consult to establish a marketing policy.

It is futile for teams of DRA people to visit prospective customers and to do little more than explain what DRA has done. The message must be "what can DRA do for you, the customer?".

2. *Sales*

I believe firmly that the level and frequency of sales activity is directly proportional to the level of business achieved. I think that DRA must invest heavily in its sales force. The type of person required for this function is unlikely to be anybody with a long career, even if successful, in a Civil Service environment. It is probable that people with significant industrial experience will be more suitable.

Responses to a selection of questions in the Call for Evidence

1. DRA AND ITS RELATIONSHIP WITH MOD

1.1 It is still dependent on MoD for more than 50 per cent of its business.

1.2 Assuming that commercial constraints improve efficiency, the DRA should be able to offer equal or better service than industry. To date this does not seem to be the case.

1.3 No response

1.4 No response

1.5 It is probable that the DRA will be seen as a potentially serious competition to a defence industry which is already beset with the problems of harsher competition caused by a shrinking market. This will prove a very difficult problem to manage and, as far as the UK market is concerned, will require a high degree of compromise and joint activities to establish reliable working relationships. Pragmatism, commercial acumen and salesmanship are attributes which are vital for the succcess of the enterprise.

1.6 As in any strategic planning activity, the market will dictate the policy. With the exception of the last point, all the considerations listed should be addressed by a powerful marketing function with the DRA. Although dramatic and far reaching, all the factors listed can be regarded as market constraints or sensitivities.

The final point is important: is it the responsibility of the DRA or the MoD to decide which technologies should be retained within the UK? It is a subject which merits considerable discussion.

1.7 Although the MoD is seen as the DRA's major customer, this situation can not continue if:

- MoD's expenditure continues to fall
- DRA is expected to grow.

If the above two conditions are to be met, then MoD is clearly in danger of losing its apparent position of having first call on DRA's research services.

2. DRA'S MANAGEMENT, INTERNAL AFFAIRS AND STRATEGY

2.1 No response

2.2 No response

2.3 No response

2.4 No response

2.5 No response

3. DRA'S RELATIONS WITH INDUSTRY, EUROPE AND BEYOND

3.1 Since a large proportion of DRA's current work is MoD funded, it is unlikely that civilian spin-offs can be a major concern. Diversification from defence is notoriously difficult to achieve profitably; any major step to establishing a non-defence activity within DRA should be planned under a different structure which will establish a culture and modus operandi more appropriate to the civil market. This structure should be able to look into existing technologies developed within DRA and to use these as appropriate.

3.2 No response

3.3 No response

3.4 No response

3.5 No response

3.6 I do not believe that the DRA should have a major role in conversion and diversification if it retains its present structure. Comment under 3.1 is relevant.

3.7 DRA should relate to non-defence industry with reciprocal non-defence department or structure which has an appropriate culture and knowledge of the industrial sectors in which it aspires to operate.

3.8 Scope does exist for potential conflict with private industry. The problem can be handled by establishing frequent high level contacts within private industry, by work sharing arrangements and by teaming for specific projects.

3.9 No response

3.10 Where security considerations permit, it ought to seek European collaboration as a matter of course.

3.11 No response.

Memorandum from the Institute of Biology

The role of the DRA clearly needs to be examined, as it is, by the Select Committee. The DRA cannot be a multi-functional organisation where strategy and tactics are confused, but should confine its status to that of a trading fund and act as an agency for research related to MOD projects. It would be impossible for applied bioligists to formulate strategy for the DRA. However, as far as Section 2—its management and corporate strategy—is concerned, the important point is to limit its role to that of an agency. In this respect it would act as a broker between independent research groups (university, commercial, or even freestanding), who might bid against the research needs of the MOD virtually on a tender basis, although it is to be hoped that cost would not be the only consideration in the awarding of such research tenders. It would be wrong to create yet another agency which would retain its own staff of scientists other than those needed to evaluate the needs of the MOD and the abilities of contractors. It should therefore need a relatively small core of staff, but a considerable number of consultants who would advise it on the appraisal of programmes and the research available to carry them out. It is difficult to see how the DRA itself would identify future defence needs and, if it were to take on staff for this, there would be a conflict of policies between the MOD, the DRA and the major armed services themselves.

The Pathfinder programme would have to stand alongside others of this kind which purport to bring together basic or academic research and the world of commerce and industry. None of these has been particularly successful on the whole, although there have been a number of individual successes. It would be sad to see more than one body continuing in this role.

Those who discuss matters like duplication of research clearly don't understand the way research operates. There are several monitoring agencies for research in the Health Service for instance, both at regional and national level, whose effect is likely to be restrictive in the long run.

Section 3 discusses the DRA's relations with the world at large. Given the relatively narrow role for the DRA, this could be quite important. It would, however, be better if one of the present agencies, such as the DTI with its LINK scheme or the Techology Foresight exercise, or OST itself, be involved in DRA's work, so that there would not be duplication, not of research, but of administrative exercises. The Defence Technology exercise team should be decently buried and not exhumed by the DRA; it could only have a monitoring role in deciding whether research it brokered was in fact suitable for the non-defence industry. Currently it is difficult to see how it could align with EUCLID or EUREKA, especially in its present defence-related form.

As far as the last paragraph is concerned, research contracts with the US have generally involved direct application to the US Air Force for funding for a project. The Air Force itself had research funds which were distributed via a referee panel: there seemed to be no great need or benefit from an intervening agency.

A great deal more use could be made of military remote sensing for environmental survey, surveillance and monitoring.

Defence lands, ie military practice areas, are often of high nature conservation importance, eg battle area at Thetford and the Kimmeridge tank ranges. There used to be good liaison with the MOD over such areas, and probably still is. If not, this aspect should be stressed. It is important that MOD are aware of the management requirements of such areas and particularly sensitive habitats and species so that they may take account of these in their use of the area. They should research the effects of their (often degrading) use of such areas, eg disturbance by noise and vehicle tracks, oil pollution and other contamination, land claim and sea defence works.

Some of our members have long-established friendly relationships which have been invaluable in maintaining a reasonable degree of continuity through recent transitions and, in this connection, commend the MOD's Joint Grant Scheme and the DRA's role and performance in promoting this. Given the stated intention of the MOD that the aims of this programme are strategic, it is important that projects be supported on a longer time scale than one year; a rolling programme of 3-5 year-long elements would be much better.

MOD and DRA possess an enormous amount of extremely valuable data. There has been a gratifying willingness recently to make non-classified information available to others, witness the recent hand-over of naval oceanographic data to NERC. There is a continuing need for such data to reach national and international data centres.

Letter from the Institute of Physics

Thank you for your letter of 22 November enclosing a copy of the Select Committee on Science and Technology's call for evidence for their enquiry into the Defence Research Agency (DRA). The Institute of Physics is pleased to submit the following views on the DRA and its external relationships.

INSTITUTE OF PHYSICS CONCERNS

The Institute is particularly concerned about DRA and its future for several reasons. Defence research is primarily based on physics and, in particular, two disciplines of physics—electronics and optics. As a consequence, the Institute has a strong cadre of members within DRA and these are particularly active throughout all the Institute's activities. The DRA also has a justifiably high reputation for excellence in physics research and the Institute is concerned to ensure that such excellence is not dissipated, diluted or destroyed by changes in organisation, management or funding brought about by the end of the Cold War. The UK's high international reputation in physics research is based in a large part of the higher education system. The Institute is also well represented in industry and one of its aims is to encourage wealth creation through support for physics-based companies.

NEED FOR THE DRA

The Ministry of Defence needs DRA both for technical *advice* and high quality *research*. There are arguments that the research can be carried out elsewhere—in industry in particular and maybe in universities—and this possibly at a lower cost. But such an approach could seriously jeopardise the provision of advice to the MoD. In principle, advice can be obtained from industrial sources, but continuity and independence of advice would be difficult. Experts who are aware of operational needs but not linked with commercial suppliers are rare. Also, expertise fades unless practised and the experts *need* to be involved at the frontiers of research and development. Within DRA, these conditions are met.

RELATIONS WITH INDUSTRY

It appears to the Institute that the current relationships between DRA and industry are extremely confusing to both parties and this is potentially damaging to the technology base in the UK. There is no workable mechanism for ensuring that existing expertise and knowledge within the DRA can be used effectively to assist the civil sector. Also, there is a great danger that much technology which is potentially useful to the civil sector, but not considered crucial to the defence effort, will be lost as a result of cutbacks in defence spending.

The lack of a workable mechanism is particularly disappointing as the possibility of spin-offs should be a significant factor when funding defence research for spin-offs can substantially defray the cost of defence equipment. It is too early to judge the value of the Pathfinder scheme which is in its second year of operation but early results are disappointing with experience of a 15 month delay between the presentation of an idea and the award of a contract.

Another issue which needs to be dealt with concerns Industrial Property Rights. The DRA itself is not skilled in selling IPR and experience has shown that IPR can be sold to foreign companies at a higher price than to UK organisations. Price should not therefore be the prime consideration when selling IPR as it can clearly be argued that UK companies have already contributed to the costs. The DRA needs to acquire acumen in this area or the activity should become the responsibility of some other body.

There is a proposal which deserves serious consideration for ensuring that there is minimum dilution of the strategic research base within the DRA. It has been suggested that the MoD, the Engineering and Physical Sciences Research Council, the Department of Trade and Industry and other government agencies should pool their available funds for research, with all interested parties allowed to bid for these funds. This would, of course open up the civil sector to DRA scientists and also increase access to MoD funding for universities and industry. This is a highly contentious issue and goes against a recent decision of the government that SERC funds are not open to industrial researchers but it would ensure that government funds are used to support the highest quality scientists in the country irrespective of their affiliations.

RELATIONS WITH UNIVERSITIES

One of the first casualties of a reduction in DRA funding are the funds which DRA uses to sponsor university research. This is inevitable, as the DRA will take time to build up its funding from non-MoD sources and, indeed, to reduce its overhead costs of administration and other support activities which is necessary for the organisation to survive with trading fund status. Meaningful interaction between DRA scientists and those in universities and industrial research is essential to ensure that science is practised and applied at the forefront of knowledge. While many DRA scientists hold honarary posts in universities, more needs to be done. A proposal which needs more consideration is that "dual technology centres" be established at the DRA sites which would allow industrial and academic staff to be based at the research establishment for a short period with complementary exchange arrangements at universities and industrial companies. Such centres can probably only be successful if additional funding is available and it seems to the Institute that funding for such centres should be obtained from industry, the Department of Trade and Industry and the Ministry of Defence.

OPERATION OF THE DRA

The Institute welcomes moves to improve the cost effectiveness of research within the DRA but is concerned that such moves might be accompanied by considerable bureaucracy and micro-management which would be counterproductive. Such developments would have a detrimental effect on communication between the DRA scientist, the military customer and the industrial contractor.

The Institute is also concerned with reports that the DRA is expected to seek up to 20 per cent of its funds from non-MoD sources. Effective research depends on there being a critical mass of scientists, equipment and expertise available and this would be jeopardised if the core support were reduced by up to one fifth. External, non-MoD contracts will cover a multitude of scientific areas, will be very specialised in nature and the funds will not necessarily by used to ensure the continuing viability of expert groups within DRA. High quality research craves thinking time and pressure on research staff to account for every hour of their time sits uneasily with the need for contemplation.

The Institute trusts that comments will be of value to the Select Committee in its deliberations. Please do not hesitate to ask for any elucidation or additional views.

Letter from Sir Peter Kemp KCB FCA

Thank you for your letter of 10 December, which we spoke about.

As I told you, any contribution I might be able to make to the Sub-Committee's work relates to my involvement with the Defence Research Agency (as it became known) as it was being established as one of the early Agencies under the Next Steps Initiative, and the work that went on at that time between me and my Team in the Cabinet Office, the embryo Agency, the Ministry of Defence, the Treasury, and others. Most of this work was completed so far as I was concerned some time ago (the DRA was established as a Next Steps Agency in April 1991), and of course I left the Service in August 1992 and am not able to consult official papers. But all that said, given the importance of the DRA and of its status as a Next Steps Agency, it seems to me that even with these caveats some personal reflections from myself might be of interest to the Sub-Committee.

First, a brief word about the Next Steps Initiative itself. Much has been written about this including a series of examinations by the House of Commons Treasury and Civil Service Committee, White Papers setting out the Government's replies to these examinations, Annual Reviews of the Agencies (the latest being Cm 2430 of December 1993 and I attach from this DRA entry and the bibliography (*not printed*)), Framework Documents, reports and accounts and often corporate plans and the like from individual Agencies, as well as a rapidly increasing corpus of academical and sub-academical comment and critique. However there are two documents rather easier on the eye than most of these which the sub-committee may like to glance at; "Setting up Next Steps—a short account of the origins launch and implementation of the Next Steps Project in British Civil Service" (HMSO 1991), and a recent little booklet I produced myself entitled "Beyond Next Steps: Civil Service for the 21st Century" (Social Market Foundation, 1993) which as well as setting out some history and description, sets out some ideas about the future development of Agencies, some of which could well apply to the DRA. For convenience I attach copies of each of these (*not printed*).

As you will see from "Setting up Next Steps", the Defence Research Agency (at the time described as "Non-Nuclear Research Establishments") was amongst the initial twelve activities announced by then Prime Minister, Mrs Thatcher, at the launch of Next Steps in February 1988 as *prima facie* suitable for Agency status. In terms of manpower it is not the biggest Agency, as you will see from the current list that I attach, but it probably presented more difficulties and complications than most. There were a number of reasons for this, which I set out below from memory and in no special order, thus:—

- The DRA (as I shall call it) was an enormously complex organisation, far more so than most Civil Service organisations and indeed many other industrial concerns, public or private, in this country.
- Integration as appropriate of the various predecessor establishments had hardly begun.
- The background was difficult—a slimming down of defence capability (which soon turned into the formal exercise "Options for Changes"), and the knowledge that the Agency and its assets and its workforce were too big and would need radical change.
- Customer contractor relationships had not been properly developed, or indeed in many cases not developed at all, so there were no reliable measures of customer satisfaction, efficiency in performance, and so on.
- The state of the record keeping, book keeping, costing, etc at the time left a great deal to be desired.
- Civil Service methods, including financial rules relating to annuality and the like, on the one hand, and pretty rigid Civil Service pay and conditions, together with a high degree of unionisation, on the other reigned.
- Considerable tension existed as to the so called "Prior Options" exercise, whereby it was the rule that potential Agencies should be studied to see whether they had to be kept in being, or if so whether they could not be privatised wholly or in part, and only if those were ruled out should they be

established as an Agency. The lobby in favour of at least partial privatisation was vocal and powerful.

- The same went for the debate over how far the DRA should be allowed to take on non-government customers.
- Top management was weak and Civil Service minded and dominated by the MOD and the military. The culture needed a big shake up.

This picture as painted might lead to the Sub-Committee to ask why, in these circumstances, it would not have been better to settle these issues before rather than after the establishment of the Agency. Such a point of view was also pressed in certain quarters in Whitehall. But the contrary point of view—that whatever these eminently curable downside factors were, the DRA was at heart a sound and indeed vital piece of British industrial and research infrastructure, and that the best way to put these points right was in the context of the establishment of the Agency—won the day.

The key milestones down this track were agreement over the position on privatisation—a compromise but at least a workable one, agreement on the way to plan and execute an appropriate down sizing of the Agency, agreement in principle to a customer contractor relationship with MOD and other customers, agreement in principle to a move in due course to a trading fund, and, crucially, the recruitment from the private sector at an appropriate salary of a new Chief Executive. As we saw with other Agencies, the process of set up proved a wonderful catalyst for positive change.

The upshot of these various agreements was that the DRA was indeed duly launched as from April 1991. It was not perfect at the time of launch—in fact few Next Steps Agencies were, the launch date being more often a sort of cease-fire line rather than a position of perfection—but enough had been done and planned to be done to make it reasonably likely that the Agency could go forward satisfactorily and effectively serving the needs of the Ministry of Defence and its other customers. And so, as I understand it, it has turned out.

From my point of view as Next Steps Project Manager no activity that was set up as an Agency was ever like any other; everything was different and as I used to say there was no "blueprint or mould". But the DRA probably presented in its one entity pretty well all the sort of difficult issues which were variously met in other Agencies, though not always in the same Agency; and also, more positively, represented precisely the sort of activity which it was envisaged in the original report by Sir Robin Ibbs would benefit from Agency status. This is the sort of activity which I described in my booklet "Beyond Next Steps" which I have just referred to as being in "the gap in the structure"; that is, activities which for one reason or another need to stray within the Civil Service and be directly accountable to Ministers but which could, nevertheless, be better structured and organised with the best of private sector individuals, skills and disciplines bought to bear.

Much no doubt still remains to be done, and I dare say that the Sub-Committee will enquire into this. Particular areas to ask about might be whether the relationship with the MOD as "owner" (as opposed to that as "customer", though that is extremely important also) is working, whether the Agency has sufficient freedom eg in financial and personnel terms to manage itself effectively as a free standing unit within Government, how the "market testing" exercise is going and how it sits with the Agency's research functions, and the possible benefit of the introduction of private finance. More generally as I indicated in my booklet external circumstances change and with this may have to change the shape and structure of entities such as the DRA if they are to continue to carry out the function Ministers want them to carry out. But the Agency formula is a flexible one,—Professor Peter Hennessy has described it as a "transferable technology"—and should be able to cope with these future changes. The important thing for the future is to keep an eye on the job the DRA is to do, and make sure the structure is suited to this; rather than fall into the old Civil Service trap of letting the structure dictate the job.

I am aware that the Sub-Committee may find what I say rather discursive, but I hope they will find it useful in helping paint in some of the backround to their enquiry. I emphasise again that what I say is entirely personal. I am of course at the Sub-Committee's disposal if I can help any further.

Memorandum from Michael Lawrence

Further to a letter of invitation dated 23 November 1993 from the Clerk to the above sub-committee, I have pleasure in setting out my response to its call for evidence, based on my observations as an external member of the DRA Council. I have only responded to those questions where I believe that I may be able to provide an additional perspective that the sub-committee may find helpful.

1. The DRA and its relationship with the MoD

1.1 *How independent of the MoD is the DRA?*

There has to be a natural limit to the DRA's independence given that the MoD is the owner and principal customer. I would also expect it reasonable for MoD to expect the DRA to continue to provide a range of existing services, including scientific and technical advice, to the MoD unless alternative arrangements are available. This is to ensure the the operational capacity of the armed forces is maintained at all times. (See also the sub-committee's question 1.7).

On the other hand, the Chief Executive of the DRA has complete formal responsibility for the effective and efficient use of DRA resources, for its financial procedures, and the preparation of Trading Fund accounts. Its income derives from its customers, from which it has to cover the costs of its operations and achieve a return on capital employed. As part of the arrangements for establishing its Trading Fund status, revised procedures for costing work and for competitive tendering were developed which put the DRA on a more arms-length commercial basis with the MoD with potential benefits to both parties.

2. THE DRA'S MANAGEMENT, INTERNAL AFFAIRS AND CORPORATE STRATEGY

2.1 *Will planned restructuring and rationalisation affect excellence, or will it succeed in helping the DRA meet its new budgetary challenges without hindering quality?*

2.2 *Is the pace of rationalisation too fast, or a logical and necessary consequence of the setting up of the agency?*

The restructuring and rationalisation has included revised management organisation and responsibility, personnel policy, analysis of the use of assets, a re-examination of all activities and consolidation of research effort. One of the consequences has been to empower line managers by increasing their individual responsibility and by giving them greater interaction with their customers. I would not expect the responsiveness of the DRA, and the quality of its output, to be diminished by this process. What will be tested however, is the discipline between the contracting parties in defining and meeting requirements at acceptable cost.

In the substantial rationalisation of this nature, many of the issues that have to be faced are interactive. It is therefore often illusory to believe that problems will be reduced by slowing down the rate of implementation, and indeed the opposite may be true. The corporate and business plans prepared by the DRA in advance of the actions that were taken were comprehensive and focused on the many qualitative, as well as quantitative, issues essential to achieve a successful future.

2.3 *What are the implications of the new regime's freedom to set salary levels in order to recruit and retain staff, and how capable is the DRA of recruiting the best staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?*

A substantial number of the staff employed pre-rationalisation were not engaged in research, but were concerned with support and administrative arrangements. Partly, this was a natural consequence of the very large number of sites on which the DRA operated, each with their own security and other requirements. Therefore the consequent savings in employment costs were an essential step in improving the cost-competitiveness and hence the DRA's ability to survive in a market-testing environment. The benefits ultimately flow back to the MoD in lower expenditure and/or greater purchasing efficiency.

If the MoD continues to allow competition in its procurement policy, then the DRA will need to compete with third-party contractors to recruit and retain specialist staff, not with the MoD. Ability to pursue a personnel policy outside the constraints previously applied is therefore an important flexibility for DRA management.

The research culture evident within the DRA, and the fact that it has offered career employment to its research staff, suggests to me that it should be able to retain the staff it wishes to keep. The management information processes now in place should also provide the necessary information as to staff performance and enable DRA management to provide a fair reward system.

Memorandum from Pilkington Optronics Ltd

1. INTRODUCTION TO PILKINGTON OPTRONICS LTD

Pilkington Optronics Ltd is one of the United Kingdom's leading defence companies, with a turnover of £74.4 million (1992–93), 95 per cent of which is due to sales of defence electro-optical equipment to the Ministry of Defence, and to prime contractors in the UK and overseas. The company is a successful exporter of defence equipment and, for instance, is the sole supplier of head up display optical modules to the US F16 programme.

In the UK the company is best known as the supplier of all the Royal Navy's submarine periscope systems, for the Gunner's Primary Sight and the Thermal Observation and Gunnery System (TOGS) in Chieftain and Challenger tanks, and for night vision equipment, eg Common Weapon Sight, Warrier sights and all the Passive Driver's Periscopes for the British Army.

The Company is now a 50/50 Joint Venture between Pilkington plc and Thomson CSF, and is developing a strong competitive position in France as well as its dominating position in the UK's optical industry.

The Company has maintained a leading edge in its key technologies and has invested heavily in state of the art manufacturing processes and superb new custom built premises, and by relentless productivity improvement has drastically reduced manning whilst maintaining market share.

The Company's strategies include the development of non-defence business which is strongly related to its core technologies and markets.

2. PILKINGTON OPTRONICS LTD AND DEFENCE R&D

In recent years there has been a serious decline in R&D Sales to MoD, (see Figure 1 (*not printed*)). As development programmes such as design and development of periscopes for Trident submarines and sighting systems for Challenger have been completed and production has started, there are no new major MOD funded development programmes underway. The next major opportunities are likely to be Batch 2 Trafalgar and the Tracer AFV series.

At the same time research funding has similarly reduced, and on top of this, in areas where the DRA has supported extramural research, offers of 50 per cent company funding are required in order to win contracts.

In spite of a shrinking market leading to, at best, flat sales, and in spite of major investments in process technology and new facilities, the Company has increased its self-financed spending on R&D (Figure 1), and tried to maintain a balance of activity in longer term as well as in near market research, carefully focusing effort for maximum future benefit.

However, there is no doubt that the reduction in MoD funding is *not* being recovered by funding from other sources, and this trend must cause great concern for future capability. There is no sign yet, in terms of funded programmes into which the Company can bid, of MoD's stated policy to accelerate funding of Demonstrator Programmes. Still less is there any sign of emergence of a much needed structured plan for Research and Development which could lead to continuity of effort, and joint integrated MoD/industry thrusts in directions set by development of national objectives. We would draw attention to the submission by the Defence Industries Council, "Government and Defence Industry—Working Together", to the Secretary of State, dated 24th November 1993.

3. PILKINGTON OPTRONICS LTD RELATIONSHIP WITH THE DRA

Against the background outlined above, the DRA and its balance of intra and extramural research, is seen as a very important contributor to the future competitive position of defence companies, as well as to the intelligence of MoD as customer for advanced technology products.

The DRA has been a major source of innovation in the technologies which are core technologies for Pilkington Optronics. An example of this is the world lead in infra-red detectors for thermal imaging which originated at Malvern and which led to the UK's very competitive position in thermal imaging equipment.

Pilkington Optronics is concerned to maintain and to develop its relationship with the DRA, and in particular to work with the DRA to align technology objectives in research, and to obtain as much support as possible for programmes designed to benefit both parties by best use of each other's resources.

The DRA's initiatives such as Pathfinder are a welcome start for increased co-operation, and the DRA has appointed a senior executive to act as a focal point for Pilkington Optronics contacts and development of joint policies.

It is vital to a successful relationship between the Company and the DRA that the DRA's primary roles continue to be those of impartial adviser to MoD and of maintenance of innovative research in key areas providing the UK with battle winning technology. The relationship is unlikely to be sustainable if the DRA becomes a privately funded research organisation competing with the Company for MoD funding and protective of its intellectual property, but without the responsibility of matching research into the market for equipment and into production facilities in terms of capacity and capability. The future role of the DRA is not yet wholly clear.

4. QUESTIONS RAISED BY THE SUB-COMMITTEE ENQUIRING INTO THE DRA

The following paragraphs are numbered to correspond with the Call for Evidence, and represent the views that Pilkington Optronics Ltd wishes to present on the issues raised by the Sub-Committee.

1. THE DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH MoD

1.1. The DRA is still seen as part of MoD independent only in respect of a separate management reporting through the Chief of Defence Procurement to the Secretary of State. The DRA appears to be dependent on MoD for funding (rightly in our view). However, the DRA appears now to seek much more overtly to satisfy the needs of its MoD "customer" by responding to MoD Package Managers.

1.2. The DRA's status as a trading fund was initially seen as a hindrance to co-operation with industry, due to emphasis on the DRA becoming an independent competitive research organisation. It was feared that the DRA would become less likely to fund extramural activity to protect its own internal activities and its staffing. Development of increasing independence of the DRA from MoD was seen as a threat to efficient use of MoD/industry resources (and therefore a hindrance to provision of best quality research to MoD), and to joint tackling of national objectives, if the DRA were to become a competitor rather than a customer/collaborator.

However, following announcements that, after all, the DRA intended to remain primarily a service to MoD, including the ability to provide impartial advice to MoD on competing industry submissions, and to obtain other sources of funding when consistent with being able to maintain impartiality, the prospects of working in partnership with the DRA have improved. This has been strongly reinforced by the DRA Chief Executive's new initiatives for collaboration with industry which are seen as very positive moves in the right direction. The DRA's status needs to be confirmed as a service to MoD, and its duties should include the development of partnership with industry in a way which preserves its impartiality when assisting MoD to choose between industrial competitor's products and programmes.

It is not clear to us how the performance of the DRA is measured, and therefore reported, and we respectfully suggest that many of the questions raised by the Sub-Committee would not have been necessary if clear measures were in place against which progress can be tested.

1.3. The DRA's research strategy is not yet wholly clear to us due to residual doubt about its status, and concern that the DRA may be trying to be impartial adviser to MoD collaborator, and competitor for the same funds all at the same time.

1.4. —

1.5 We would expect the DRA's new status to lead to it to increasingly look to other government departments for funding (eg DTI) and to industry (defence and civil, including overseas).

The DRA's new status may result in a tendency for MoD to assume that it can reduce its funding and that this will be replaced by other sources. However, the inadequate level of funding by MoD to achieve its research objectives had already caused the DRA to seek industry part funding of extramural research aimed at satisfying MoD's requirements. This company funding is a bid requirement without which a contract is unlikely to be received, and is not a collaborative DRA/company thrust aimed at joint alignment of Company/market interests with MoD's own needs.

The relationship with industry which the DRA now seeks is very welcome, as this consists of improvements in communication, initiatives to develop collaboration, and initiatives to consult and work with industry to create focused research playing to national strengths. The success of these initiatives depends significantly on the funding being made available by MoD to back its objectives, supporting the prioritised and focused programmes that emerge.

The DRA could greatly assist the development of national research objectives which cover the interests of MoD, the DTI and UK Ltd.

It is not yet clear to us whether the DRA in its new status has sufficient funding and backing from government to maintain the more innovative and long term defence research programmes which are not near market and whose benefits are not yet clear to, or demanded by a Package Manager in MoD. We believe that the MoD's strategic research programme for defence should be published with content similar to the US Department of Defense's annual Critical Technology Plan. This contains milestones for critical technology eg by 1995, by 2000 and by 2005 as national objectives.

1.6 We are not party to the formation of DRA strategy, but believe that the questions raised need to be addressed urgently.

Many of the changes in the nature of conflicts that are now arising were studied by the NATO Industrial Advisory Group and reported in their Technology Forecast Post 2000 (TF 2000). Recommendations were given for research including likely expenditures, and the report has been welcomed in NATO. It is an example of how industry effort can be efficiently harnessed to help create strategic plans for defence research such as are needed in the UK.

The DRA is now trying to determine, in discussion with industry, how to focus its budget on areas which are both important to MoD and where the UK can stay at the leading edge. This initiative should be strongly supported.

A published overall strategic plan for defence research with milestones, and consideration of what capabilities are needed within the UK to maintain sufficient independence of action and sufficient credibility and international defence muscle could be used to put in place objectives against which budgets can be set and tested.

1.7 It makes sense for services which are needed for technical developments associated with defence and needed nationally and available in the DRA, but which are expensive for industry to duplicate, to be "hired out" by the DRA, and devolved to industry where possible. However, it will not be likely to be sensible for new capital investments to be made in the DRA for future services. These should be in private industry whenever possible.

2. *The DRA's Management, internal affairs and corporate strategy*

2.1 We would expect that a well managed programme of restructuring and rationalisation would certainly lead to benefits for research quality, as structure costs and overheads reduce allowing a greater proportion of resources to be concentrated on research. It will be important for the DRA to gain from its increasing efficiency, and therefore to be able to free resources for its research, rather than to be working hard towards a reduced budget.

If the DRA focuses on right technologies, excellence in those chosen would increase, and provided that other necessary technologies are available from elsewhere in the world and are also available and excellent, there will be overall benefit from focus and concentration of resources on research.

2.2 The pace of change is a logical consequence of budgetary pressures.

2.3 —

2.4 We consider Pathfinder to be a worthwhile programme, allowing industry to begin to align ideas with those of the DRA/MoD. The process has been further improved in 1993–94 in that the DRA has presented MoD's longer term needs in a general sense, so that industry can propose relevant R&D proposals related to its own needs. Pathfinder is a welcome lead away from prescriptive processes and it encourages alignment of interests. Pilkington Optronics is keen to participate and will look for ways to help the process forward.

2.5 We are encouraged by the way in which the DRA's programme managers are now putting together their customers' needs and communicating them to us, including their suggested areas to technology focus.

As noted above, the process could usefully put in place overall objectives and milestones with budget proposals designed to satisfy these.

3. *The DRA's Relations with Industry, Europe and the Wider World*

3.1 The linking of defence and civil needs for research is just beginning. There is discussion of creating dual use technology centres with industry and the DRA jointly developing technologies for both defence and civil use. It should perhaps be noted that spin-off from defence to civil projects may not be the only need. Spin-in and dual use may improve affordability for MoD.

3.2 Partnership between a defence company with the technology and a civil company that has the market may create the best prospects for success, in a joint development for dual use. Both parties, in sharing the cost of technology and applying it in markets well known to them, are likely to benefit without having to share their markets to do so.

3.3. The DRA's Pathfinder programme seeks to align industry and MoD aims for R&D for improved affordability and focus of the DRA budget. Technology Foresight seeks alignment of government and industry aims for wealth creation. We hope that these different objectives are compatible and mutually supportive, leading to a national set of objectives for wealth creation, with a subset focused on satisfying defence needs in a manner which is likely to create wealth also.

3.4. —

3.5. The DRA is more likely to succeed by looking for alignment with industry needs leading to whatever technology transfer arises from joint programmes. The purchase of technology from the DTE appeared to be much too expensive.

3.6. The DRA has no direct role in the conversion of diversification of industry. However, linking and complementary programmes with those developed for wealth creation, plus the development of dual use technology should assist industry to diversify if that is in its interests. True defence research is vitally necessary, should be sufficiently funded by government, and be, as it has been, an excellent source also of spin-off technology. Any additional roles for the DRA would need to be successful, and therefore the most important prerequisite is alignment of purpose.

3.7. The DRA should relate to any part of industry that is interested to work with the DRA meeting both their objectives. Relationships take time and sustained effort to be successful, and therefore the most important prerequisite is alignment of purpose.

3.8. The aspect of potential competition between the Company and the DRA is being played down, as we look for alignment of programmes and interests. This is right as we try to develop ways to develop wealth creation from defence research, highlighting it as a vital part of national research effort leading to growth of the defence industry's share of markets and balance of trade surpluses with friendly nations. The creation of another national competitor is the last thing that is needed when the need is to win overseas business to make defence more affordable at home. Therefore the DRA's current strategy to work with industry rather than to compete with it is to be strongly applauded as in the best interests of MoD, in the wider national interest, and in the interests of the defence industry.

3.9. The DRA has played a very positive and leading role in the development of EUCLID. Without the DRA's influence, with much DRA led discussion with representatives of industry, EUCLID would not have been worthwhile as an investment of time and effort by our Company. It is still a ponderous international programme with problems created by its unhelpful MOU and resulting processes, but the DRA has worked hard in our area of interest to make the programme contents useful to the UK and to its industry. The DRA's standing is high in European defence circles due to its state of the art technological position and therefore it has been able to negotiate from strength.

3.10. The DRA does not appear to seek international co-operation as a matter of course, but we would hope that in future the DRA and UK industry would together seek to align their policies for co-operation internationally whenever it is clear that this is likely to be beneficial. Uncoordinated efforts to collaborate could be damaging, for example, if the DRA seeks an opportunity to collaborate with an Agency in the USA, but the relevant UK companies' opportunities happen to be in Europe.

3.11. The Advanced Research Procurement Agency, ARPA, in the USA had, in its original guise as DARPA, a budget and significant freedom to invest in strategic technology using fast track methods and minimal bureaucracy. The agency has the reputation of being very successful in generating rapid technological progress. We suggest that its processes be studied to see what can be learned including a look as its new role and accountabilities for dual use technology.

As mentioned above, the US Critical Technology Plan, issued annually by the Department of Defense, has much to recommended it as communication of national objectives and milestones.

The French Defence Ministry's research department, DRET, appears to have a very close working relationship with the industry that serves it. The key point of relevance may be its apparent duty to and concern for French industry capability, which does not appear to blunt its ability to make companies compete for contracts and deliver good research. Our relationship with Thomson CSF has shown that our sister company Thomson TRT Defence has a significantly larger long range research programme mainly due to the greater availability of research funding, which is due to the importance accorded to it.

The French MoD also appears to try to ensure that Demonstrator programmes are timed to assist efforts to export, which must help to make national programmes more affordable, and to our knowledge have led to enhanced competitive position in the marketplace.

We need to develop a sense of overall national interest in all our defence procurement and not just in research, to compete in Europe, in the USA, and in the Far East where national interest outweigh short term considerations of "value for money".

Letter from Professeur Alain Pompidou MEP MP—(Translation from French)

Defence Research in France, its opening to international co-operation, and its relationship with DRA

The French defence research programme is defined in two multi-year plans, one concerning basic and applied research, which is equivalent to the British SRP and ARP, the other concerning exploratory developments, which is equivalent to the British TDP.

Altogether, nuclear studies apart, these plans amount to an average yearly budget of approximately FF6600m (6 per cent of the defence budget) with a usual distribution of 15—20 per cent for basic research, 60 per cent for applied research and 20—25 per cent for exploratory developments.

These multi-year plans are defined by expert groups from the Délégation Générale pour l'Armement (DGA) in liaison with the different staffs of the armed forces. This permanent dialogue allows defence research to adapt, in the best way, to the needs of defence, and in particular to take into consideration the new geopolitical parameters as much as the lessons we draw from the localised conflicts that we are already familiar with.

All these plans are updated each year, taking into account budgetary restraints and the new priorities for defence. This update is submitted for the approval of the Minister of Defence by means of a council on defence research and studies.

Each research programme is the subject of a justification file and is managed by one department of the different divisions of the DGA. In all around 1050 projects are filed and administered, linked to about 30 technological themes (800 basic and applied research files, 250 exploratory development files).

The Research and Technical Studies Division (DRET) of the DGA has the double mission of conducting the main part of the basic research and coordinating the research programmes which form the technological plans.

The execution of research in France is essentially confined to industry. The normal distribution is as follows:

(1) 63 per cent of defence research is undertaken by industry, of which more than 5 per cent is undertaken by small businesses;

(2) 7 per cent is undertaken by universities and research centres run by other ministries;

(3) 15 per cent is undertaken by organisations under the supervision of the Ministry of Defence, ONERA (Office National d'Etudes et Recherches Aéronautiques) and the (Franco-German) Institut Saint Louis;

(4) only 15 per cent of research is done by establishments belonging to the Ministry of Defence.

Around a thousand organisations are concerned.

This predominance of industry in defence research is one of the essential differences between our system and the British organisation, where DRA gets the major part of the research budget.

We must have a constant concern to maintain a judicious equilibrium between an independent source of expertise which depends on the performance at the heart of the Ministry of a minimum amount of research and studies in state establishments and a significant amount of research in the armament industries, which are more able to make good use of this research and technology, including for ends other than defence.

Therein lies one of the major advantages of our organisation: the density of the network of public and private laboratories involved in the performance of defence research is a guarantee of the best use of dual use technologies.

Seen from France, the recent initiatives of DRA to increase dialogue with business, notably the "Pathfinder" initiative, come from the same preoccupation and should be fruitful.

Our constant concern, like that of MoD and DRA, is to have regard ever more attentively to the osmosis between civil and military research. A continuous dialogue is maintained between the staff of the Ministry of Defence and those of civil ministries. Thus the Conseil Scientifique de la Défense, composed of members of the scientific and industrial worlds, plays an active role in the orientation of defence activities. Numerous meetings are organised between civil and military experts, concerning specific themes as well as more general aspects. Furthermore the Conseil des Recherches et Etudes de Défense (CRED), which is the highest ranking advisory council, brings together not just senior military but also senior civilian officials.

This preoccupation with dual use technologies and with industry has been even more recently illustrated by the decision to create within the DGA a "delegation for the preparation of the future" whose role will be, among other things, to ensure that future choices reflect a judicious balance between the satisfaction of operational needs and the maintenance of a strong technological and industrial base.

It is appropriate to mention the importance of international aspects of defence research. Two major themes must be sustained and expanded:

(1) the first is the exchanges of information which permit experts to compare their knowledge and solutions for the future. France is represented today in more than 450 international bilateral and multilateral exchange groups. Among these are 150 bilateral Franco-British groups, where 90 per cent of the British representation is accounted for by the DRA;

(2) the second concerns the research programmes which are conducted in common, either bilaterally or multilaterally. About 27 common Franco-British programmes are currently taking place, representing a common investment of the order of FF1bn, with the DRA being the main [British] actor, as much in its "official" capacity as in its role of "supplier of service".

Franco-British co-operation in matters of defence research has a bearing in many fields such as radar technology, materials, acoustics, lasers, chemical and biological defence, explosives and the techniques of conception and integration of weapons systems.

Other important fields could usefully be opened to co-operation shortly, such as aeronautical propulsion and satellite telecommunications. That is in any case the wish of France, which has made some proposals along these lines to the United Kingdom.

Many multilateral programmes have likewise been started, and in particular some 40 European EUCLID programmes, representing a European investment of the order of 280 million ecus, for which France, the United Kingdom and Germany are the most important contributors, which is in line with the notable differences between their budgets and those of the other European countries.

Once again, the DRA acts not only in the capacity of expert state authority in the management groups of this programme, but also as an industrial partner in European consortiums.

Seen from France, the involvement of the DRA in international and, in particular, European co-operation is important and the status of the DRA has not raised any major difficulties in the initiation and running of these programmes.

Finally, concerning the complementarity of European co-operative activities in the area of defence research with those of the European Community and the EUREKA programme, this is something that we keep a careful eye on: the Directorate of Research of the DGA is involved in all internal French meetings for the direction and selection of Community and EUREKA programmes.

On the other hand, the participation of state research establishments is quite marginal, but that is explained once more by the fact that 85 per cent of our defence research is carried out by industry or organisations external to the Ministry of Defence.

Memorandum from Q-Par Angus Ltd

SUMMARY

These comments are made from the viewpoint of a company of 10 employees specialising in research and development.

They concern:

Pathfinder

We consider this programme desirable but unnecessarily complicated. The time scales are protracted, especially as the scheme is aimed at research.

Conflicts of Interest

Particular reference is made to IPR and to the imposition of last minute terms and conditions on DRA contracts.

INTRODUCTION

Q-Par Angus is a company employing 10 people and specialising in the design and manufacture of microwave components. About 50 per cent of our work is, directly or indirectly, for MoD. Our comments are limited to these matters of practical concern to ourselves.

PATHFINDER (Question 2.4)

Our company is in receipt of Pathfinder literature and our MD attended the Pathfinder Conference on 24-25 November 1993. We have also undertaken design and research contracts for MoD over a considerable number of years.

We make the following points:

(1) We recognise the need for a Programme such as Pathfinder in order to find the right opening for good research ideas. We believe it would be better run by MoD than by DRA in order to simplify the system and to allay any suspicion of conflicts of interest.

(2) The present Pathfinder system appears unnecessarily complex.

(3) At the two-day conference (mandatory to all applicants) the sessions consisted almost entirely of repetition of the written material. Attendance at these sessions was really not necessary. We would suggest replacing the conference with an exhibition (attendance optional) with Pathfinder staff available, and a few simple refreshments instead of the extravagant entertainment supplied last year.

(4) Time scales involved in Pathfinder are inordinately long, being 12 months from submission of proposal to contract award. A new idea could be superceded or developed elsewhere. Additionally as a commercial concern we would be suspicious of DRA (also attempting to be commercial) having access to our ideas for this protracted period.

(5) Perhaps DRA could learn some lessons from the DTI "SMART" scheme, which we find to be relatively simple and swift.

CONFLICTS OF INTEREST (Question 3.8)

These are bound to arise as DRA attempts to become commercial itself. Our own experience is that offers of contracts from DRA are frequently accompanied by terms and conditions not previously discussed. A recent contract of our own involved conditions on IPR which were heavily weighted in favour of DRA. With the completion date for the contract already uncomfortably close, and the proviso that the contract could only be accepted on those terms, we had little option but to accept.

Clauses such as this could deter companies with novel ideas from dealing with DRA or from giving their best services.

Memorandum from Sir Charles Reece KBE FRSC

The Committee should be reminded that the prime role of the Defence Research Establishments was to provide a technical service to the Procurement arm of the MoD and the accounting officer for all its activities was the head of Procurement. Over the period ACOST carried out the study "Defence R&D: a National Resource" published in 1989 it was estimated that the Research Establishments carried out less than 20 per cent of their expenditure on research ie knowledge generation. Most of their resources were used in giving technical assistance including defining systems, equipment specification, monitoring defence contracts, testing equipment and preparing operation instructions. In the Call For Evidence the questions in subset (1) focuses on "research" and in "1.7" says that the DRA primary role is the provision of research services to MoD. Has this change in emphasis resulted from the move to Agency status? The Committee might find it helpful to get the DRA to quantify its activities in the Frascati type groupings use by the Office of Science and Technology.

The purpose of Next Step process in setting up Government Agencies is said to be:—

(a) To clarify accountabilities: the head of the Agency becomes the chief executive responding directly to the Secretary of State of the prime customer Department The delegated authority of the chief executive is defined in the Framework Document agreed when the Agency was set up and by a revised Framework Document which the Central Government departments asked to for this year. An Inter-Departmental study chaired by Sir Angus Fraser examined the relationships between Agencies and Government Departments and made a number of recommendations for improving system (ref 1). To assist Ministers, it was suggested that a named senior member of the Department should be personally responsible for acting as a link between the Minister and the Agency, and although the DRA was not mentioned in particular in the four types of Agency groupings they analysed, it was claimed that the Defence Support Agencies could be accommodated in their recommendations. The Committee may wish to determine if the MoD has followed this recommendation and if so to question the named senior civil servant.

(b) To improve efficiency by making the Department and Agency behave as a purchaser/contractor operating within a free market. From my experience working with another Agency, defining the market, describing the customers and competitors and establishing a market strategy is proving to be a very difficult task where there is no historical case for describing these commercial relationships. The Committee may wish to question the MoD, DRA, Universities and private sector Companies about this. For example:—

Is the DRA free to adapt and market its skills in civil as well as defence opportunities?

Does the private sector and the DRA compete on equal terms for MoD contracts?

Is the DRA free to manage its considerable assets in a cost effective manner?

What risks are being taken in the drive for efficiency as defined by the Treasury?

Under the rules of the EEC will non-UK based organizations be able to compete?

Some of this information will be available in the Three Year Corporate Plan which the DRA is required to produce as part of the "Next Step" process.

Following the publication of the White Paper "Realising Our Potential and the report on privatization of Government Agencies by Levine and Stewart, a cross-departmental study has been set up by the OST to examine common interest groups of Agencies. The Committee may wish to enquire from the chairman of this working party how he is approaching the grouping of the DRA with others.

REFERENCES

Ref (1) Making the Most of Next Steps: the Management of Ministers' Departments and their Agencies. Sir Angus Fraser; May 1991

Memorandum from Ring Sights Limited

SUMMARY

Ring Sights Ltd specialises in unit power sights for direct fire weapons (rifles, pistols, sub-machine guns, machine guns, light anti-armour weapons, cannon etc), both military and civilian.

Our designs are sold worldwide.

Because, in our view, the military requirements do not reflect what can and should be done, we develop sights to our own specifications. Many of these are patented.

Such sights have been adopted by the UK Forces in competition with those designed or specified by the UK R&D Authorities.

We regard these two observations as showing that the R&D advice given to the MoD is not good enough in this particular field.

This field requires cheap, cost-effective, sights which are not of great interest to defence industry. So, unless the DRA is capable of generating and requiring such sights from industry, these sights will not be available for our weapon programme.

For the DRA to be so capable, it must have staff who are adequately competent and practised in the field so that they are respected both by the military and by defence industry.

EVIDENCE

1. Over the last twenty years Ring Sights Ltd (see Annex A (*not printed*) for its background) has developed unit power optical sights (no magnification) for direct fire weapons, both military and civilian, which are now sold worldwide.

2. During this time we have never developed a sight to meet a *stated* military requirement because we considered that such requirements did not advance the state of the art sufficiently. In our view the reason for that was that the advice given by the Government R&D authorities to the MoD lacked vision and competence. In addition too little work was being done of sighting for direct fire weapons.

3. Annex B (*not printed*) gives examples of the failure, in our view, of those advising the MoD on sights for fire weapons.

4. Currently NATO is considering what small arms will required in the future. As far as we can see, little account has been taken of the use of Night Vision Goggles (NVG) which are now available worldwide. Because the military have not received adequate advice from their R&D Authorities (now the DRA), no requirement has been stated to use a combination of NVG and weapon sights; at present they are largely incompatible. Yet there are great military advantages to be gained in this field. Sitting where we are with requirements coming in from abroad, we have noted that both Germany and Norway have, in the last three months, started to ask for their direct fire weapon sights to be compatible with NVG.

5. It is clear to us that the advice the military are receiving in this field from the DRA is not adequate. Unless the weapons can be aimed their effectiveness will be low; aiming requires sighting. More research is needed in this field and more competent development. Defence contractors tend only to be interested in high added value equipment yet small arms and weapons with throwaway barrels need cheap but effective sighting. This will only be generated if the DRA conceives and inspires it. This will only happen if the DRA staff are competent and respected by industry. Our experience is that neither is the case in our particular field.

Memorandum from The Royal Aeronautical Society

THE DEFENCE RESEARCH AGENCY

International developments which have taken place in the latter half of the eighties and the early years of the nineties have resulted in an upheaval in relation to defence policies around the world and this is reflected in the United Kingdom. This has had major consequences for defence research expenditure at a time when, under the Government's 'Next Steps' iniatiative, the Defence R&D Establishments have been reformed as the Defence Research Agency (DRA). In the wake of the White Paper on Science and Technology, the Government's R&D policy is the subject of considerable current debate—recent examples include the DTI's strategic plan for technology acquisition and the Technology Foresight initiative by the Office of Science and Technology (OST)—and now the House of Lords Science and Technology Committee is conducting an enquiry into the DRA. As the one multidisciplinary professional Institution dedicated to the interests of the entire aerospace community, the Royal Aeronautical Society endeavours to play a full part in promoting appropriate policies for aerospace Research & Development and Technology Acquisition, and wishes to take this opportunity to make a statement in relation to the future of the DRA.

Introduction

The House of Lords Select Committee on Science and Technology has set up a subcommittee to enquire into the Defence Research Agency (DRA). This will address such issues as the relationship between the DRA and MoD, industry and the wider world, and also its management, internal affairs and corporate strategy.

The Royal Aeronautical Society wishes to take this opportunity to make a statement in relation to the future of the DRA. In so doing, the Society will address three particular issues:

- the aerospace capability of the DRA
- the role of the DRA in an inter supportive 'cluster' of national capabilities
- dual use of DRA.

DRA as a National Asset

Aerospace technologies are extremely diverse, encompassing major areas in aerodynamics, materials, structures, propulsion, electronics and information technology. The extent and complexity of the strategic statement issued by the DTI Aviation Committee illustrate the degree to which the modern military and civil aircraft industries are equally dependent on a sound programme of R&D and Technology Acquisition.

The professional teams which make up the DRA have a well-deserved international reputation for their thorough understanding of this wide spectrum of technologies and for their record of innovation leading to new applications and the avoidance of unacceptable technical risk. That this can extend well beyond the field of defence has been often recognised, for example by the joint Queen's Award for the wing technology which was crucial to the UK securing its invaluable share of the Airbus projects. Nor is this limited to just the conceptual phase of project life cycles, as the immensely valuable work on ageing aircraft and accident analysis has repeatedly demonstrated.

None of this would have been possible had not the necessary investment been made in the extensive facilities and equipment which underpin the strength of the DRA as a national asset. The UK has not been alone in recognising the need for such capital investment to secure the future competitiveness of its aerospace industry. Both in the USA where the capability of NASA is world-renowned and in the various European facilities of high reputation, there is convincing evidence that such a stature is an integral part of the technological strength of the world's successful aerospace nations.

To do other than to continue to nurture this product of earlier and enlightened investment would be economically and technologically unsound stewardship of an important national asset.

Inter-supportive Strength

An important characteristic is usually apparent where on industry makes a substantial contribution to the national economy, as has the aerospace industry in the UK. Such success is usually based on an inter supportive cluster or network of elements, including the major industrial companies and their supplier chain, the research and academic community, the regulatory function, the financial resource and, most importantly, a viable home market.

The key features of this include the specification of realistic, yet demanding requirements, the successful accomplishment of technology demonstration, the cross-fertilisation between the scientific disciples and practical experience, and often importantly depend on successfully interfacing with other nations industries and research agencies.

In the UK, the aerospace industry, which is Britain's most successful manufacturing exporter contributing £8bn to the annual balance of payments, has been an excellent example of this model and a spectacular illustration of how this can result in competitiveness on a global scale. The DRA involvement has often been central and crucial.

Dual Use

To prosper, the UK must successfully compete on an international scale with nations where there is considerable investment in R&D and technology acquisition, such as is the case in the USA where huge sums continue to be allocated to NASA. Because of our smaller scale, it is most important that UK investment is returned over as wide an industrial base as possible.

Dual use in this context does not simply mean the application of specific defence technologies in commercial products and markets, but planning and execution of mutually beneficial dual use technology programmes and the contribution of such centres of excellence as the DRA.

In the UK the sectors of DRA contributing to aerospace have every incentive to exploit this wider concept of dual use and should be encouraged to do so. It is of paramount importance that this should be in close partnership with industry—the ultimate use of emerging technologies.

Conclusions and Recommendations

The DRA is a national asset founded on enlightened investment of national resources and every effort must be made to continue to enjoy future returns by promoting and harnessing its unique resources.

The DRA has a history of successful partnerships within the wider aerospace community and an environment must be created in which its strengths are such that it can plan a full part in assuming the future competitiveness of the UK aerospace industry, both military and civil, on an international scale.

The aerospace community, including the DRA, has played a major part in supporting the UK economy. The DRA must be given a mandate to continue to partner industry in the application of defence technologies across a wider industrial base and to utilise its expertise and facilities towards national wealth creation.

Memorandum from the Royal Society of Chemistry

As you requested, I circulated your "Call for Evidence" to many of our Fellows with defence connections. I have had few replies (one attached)—some Fellows saying they did not feel it appropriate for MoD/DRA employees to comment. Some may have commented directly to you.

In general comments about chemistry in DRA have been critical because:

(a) There appears no research strategy for matters chemical because DRA does not have a strategy other than to meet its customers needs and because MoD has no strategy of its own. This is because the practice of moving managerial staff including service appears on a 2-3 years cycle is creating a cadre of non-expert staff not well suited to developing long term strategies.

(b) There are few if any chemists in senior positions. Hence it is sometimes forgotten that weapons require warheads and propellants and not just guidance systems.

(c) Because DRA are pseudobusiness international links may be weakened.

(d) There is an increase not a decrease in bureaucracy.

(e) Without research, recruitment and more particularly retention of the best scientists will not be possible. The research budget is decreasing. With this pattern the entire research infrastructure will disappear.

In summary, the concerns I am hearing are similar to those in other parts of the chemical industry and principally relate to a very serious weakening of the infrastructure which in the past has given the UK its technological strength.

The DRA is largely an engineering based organisation—as a chemist I have concentrated on the main areas of chemical interest. These are in explosives, forensics and electronics (production of novel materials for electronic applications). There are also small amounts of work on materials analysis and on fuels and lubricants.

1.2 Operation under a trading fund means that a paying customer must be found for all work. This is not too difficult where there is an easily identifiable customer eg for explosives and forensic work. In the past the Quality Assurance Technical Support business sector provided much analytical support to the MoD. This was provided on an "as and when required" basis with any spare capacity being used to carry out method R&D. This approach could not be supported under the trading fund since no customer could be found to support the R&D.

1.3 As mentioned in 1.2 all research has to be paid for by a customer, if he is not convinced that it is in his interests he will not pay and the work is not done.

1.6 The DRA is making progress to meeting its budgetary targets by reducing the number of sites it occupies and also by downsizing the workforce. It seems likely that further downsizing will be needed in the future.

1.7 There will be a continuing need for non-research scientific/technical support to MoD and other customers. Part of the Falklands/Gulf support was the result of having staff with long experience and expertise in their fields of work. Some of these have been lost (eg 400 QATS staff) whilst others are being made more mobile such that their expertise is being diluted and lost. Such work is also very difficult to finance—you may need two hours of an expert's advice but he must be paid for the rest of the year if he is to be retained.

2.1 Restructuring and rationalisation affect excellence and are unsettling to staff. This affects morale and, when economic conditions improve, may lead many of the ablest staff to seek jobs elsewhere.

2.2 The pace of rationalisation may be a necessary result of setting up the agency but seems to be proceeding too fast for DRA and its MoD customers to adapt to, eg QATS was closed within six months of moving on to the trading fund and less than 18 months after joining the DRA.

2.3 With high graduate unemployment (> 10 per cent) recruitment is not a problem; retaining the ablest and shedding the least able may not be so easy.

2.4 General opinion of Pathfinder 93 is that it was an excellent showcase for the DRA and an invaluable interaction with industry. It is being reviewed for improvement next year.

3.1 More work will need to be done on this including more funding from non-MoD sources.

3.9 DRA has been successful in competing in Europe for contracts.

Memorandum from Air Marshal Sir Michael Simmons KCB AFC

Introduction

I was appointed Deputy Controller Aircraft (DCA) in MoD in April 1989 and retired from that post in September 1992. Prior to my appointment I had no regular contact with the MoD Research Establishment for 13 years. In preparing this submission I have had no access to official papers and while I believe the points that I make to be accurate, I do not claim that my recollection is infallible.

Executive Summary

When I assumed the post of DCA, the decision to form the DRA had been taken, but implementation had not begun and the appointment of the first Chief Executive of the DRA had not been decided.

My dealings were limited to two of the "Establishments" that were to form part of the DRA. My assessment of RSRE was that it was a well run and responsive organisaton. The situation with respect to RAE was much less satisfactory. For many years it had lacked firm direction from MoD, it was very large and I was not alone in doubting whether a significant portion of its work was relevant. I, therefore, endorsed the decision to try to put the Establishments on a more commercial footing. I was less certain that creation of a DRA was the best way forward; rigid application of the MoD's new management strategy (NMS) might have achieved the desired result with less upheaval.

The establishment of the DRA was not helped by the initial difficulty in finding a Chief Executive (CE) with a commercial background. The first CE did much good work but his replacement by Mr Chisholm led to rapid and dramatic change. This was very much for the better, although the rushed nature of the approach, notably bringing in a formal accounting system a year early, caused great difficulty for MoD (PE) project offices.

This particular aspect was a matter of considerable concern to me. Project offices relied, in varying degrees, on the Establishments to undertake project related work. Historically this support had been "free". While the change to a commercial accounting system helped to identify these "hidden" costs, the transition caused serious problems for project directors who had hitherto not had to budget for them. Once complete the change should have been to everyone's advantage, but the difficulties would have been ameliorated if the pace of change had been more measured.

Historically, the "Establishments" had been the source of a high percentage of project management staff at MoD (PE) Headquarters. Any pay differential in favour of DRA staff would, self-evidently, be a disincentive to them to transfer to MoD (PE) Headquarters unless the differential was maintained. This issue had not been fully addressed when I retired but it is difficult to see how sufficient qualified project management staff can be recruited for the MoD (PE) Headquarters if the DRA is not a major source. That said, it is also self-evident that the DRA must be able to pay its staff at a competitive rate if it is to engage and retain research scientists of the necessary calibre.

As the DRA was being established there was much speculation as to whether its role of competing for research work would be put at risk because commercial firms would be concerned that the confidentiality of their research projects might be lost. I saw no evidence to support this thesis, although it was early days, and suspected that this was something of a smoke screen set up by industry in case the DRA proved too competitive.

The key to a successful MoD/DRA relationship is clear identification by MoD of its requirements and the associated costing/funding. The introduction of a more commercial approach, inherent in the NMS and DRA concepts, should lead to substantial improvements and better value for money for the MoD. When I retired it was too early to make a final judgement on the extent of the success of the new structure.

COMMENTS ON SPECIFIC QUESTIONS

1.1 The DRA was heavily, almost exclusively, dependent on MoD for funding and for work.

1.2 I did not see the DRA's status as a trading fund making any significant difference to its role as provider to the MoD of best quality research. The change in status promised to offer more effective use of resources with less relevant work being set aside.

1.5 The DRA's new status was providing a more commercial approach to MoD/DRA business. This could also (probably) have been achieved by direct application of NMS principles to the "Establishments".

Certain elements in industry were concerned that the emergence of the DRA as a trading fund could put commercial confidentiality at risk. At the time that I retired there was no evidence to support this contention.

1.7 The ability of the "Establishments" to provide (non-research) scientific and technical services to the MoD in times of crisis was much valued. The need for such support is likely to continue; the big advantage in the past was that such support was "free". This will presumably not be the case in the future and it would be logical, where an alternative potential source of such support existed, to make the DRA compete with industry in order to ensure that MoD obtained best value for money. Where the DRA is the only possessor of the necessary facilities it is, in effect, in a monopoly position and its services should be available (on a commercial basis) to industry as well as to MoD.

2.1 I am not familiar with the detail of the planned restructuring and reorganisation. However, I am convinced that the formation of the DRA, per se, should have no effect on the excellence of its research work. Indeed, I would expect better directed efforts more closely aligned to the customers requirements to result.

2.2 The pace of introduction of the DRA was, in my view, too rushed. It resulted in significant disruption to MoD (PE) staff who had to grapple with a costing/accounting system that was simply not mature enough for either MoD (PE) or DRA staff to operate. A delay of 12 months would have allowed a smoother transition. The system should now be operating satisfactorily.

2.3 Some flexibility in salary levels is essential if the DRA is to recruit and retain those best able to meet its needs. This does lead to a potentially serious difficulty for MoD (PE) which has historically drawn a high percentage of its HQ staff from the "Establishments". These individuals have constituted a core of specialist expertise in project offices for which no other source is obviously apparent. If relatively highly paid DRA staff are to be persuaded to move to the MoD (PE) Headquarters, it is unthinkable that they should be expected to revert to normal Civil Services pay scales. If they do not, the differential will lead to resentment among those who moved to the MoD (PE) Headquarters before the DRA was formed.

The new commercial approach being applied to the DRA before I retired was having a salutary effect on the staff who had hitherto been on the "Establishments" payroll. A significant number of the less able were being shed; there was no evidence, that I was aware of, that there was a retention problem with able staff.

2.5 The DRA relies and must continue to rely to a very large extent on MoD for guidance on future defence needs. The focus of this advice should be MoD's Chief Scientist and Deputy Chief of Defence Staff (Systems).

3.8 The relationship between the DRA and private industry must allow the DRA to compete for research work on an equitable basis. There are likely to be occasions when, subject to commercial confidentiality concerns being satisfied, private industry will wish to place work with DRA. Industry is unlikely ever to be convinced that competition from the DRA is fair. However, provided the rules and constraints are explicit, industry should not feel unduly disadvantaged.

Memorandum from Kenneth F. Slater

Question 1.7

I shall give evidence about the support provided to the Royal Navy during the Falklands War by the Admiralty Surface Weapons Establishment (ASWE), now part of DRA. I will then comment on the requirements to enable DRA to provide such support in the future.

It is a feature of many modern weapon systems which embody software in their control and operating functions that it is possible in principle to modify the operation to optimise system performance against threats which are different from those which were the basis of the design.

The Seawolf short range anti-air, defence missile system is such an example. In the operational scenario for which it was conceived, rapid changes between visual (television) tracking and radar tracking were not required nor was the need for the radar tracking to cope with tight formations of highly manoeuvring aircraft. Both of these requirements were imposed on the ships fitted with Seawolf during operations in the confined waters around the Falklands.

To deal with these operational difficulties ASWE designed changes to the software and these were proved by RAF flights matching the Argentinian tactics which were mounted against Seawolf equipment in the ASWE shore test site at Eastney. When solutions had been successfully proven the modifications were transmitted to the ships in the South Atlantic and implemented by the engineering staff on board.

This is one example of many such activities by ASWE and other relevant Establishments and the timescales involved were typically one to three days. To achieve such rapid and effective responses two conditions have to be met:

(i) high grade effort available with a detailed knowledge of the design and operation of the equipment.

(ii) access to similar equipment and test and trials facilities.

In the example quoted both conditions were met. The method of procurement of Seawolf had placed the MoD in the position of being almost an "expert customer", certainly a very "intelligent customer" and the detailed design expertise was available within MoD. Procurement practices have changed and it is now likely that the necessary expert knowledge would reside in industry rather than such establishments as ASWE even without the organisational change to DRA. Further, it is increasingly likely that some complex equipment will be procured abroad and the expert knowledge would not be available in this country. An important example of such a situation was the purchase of the Exocet anti-ship missile from the French. In this case the MoD was an "ordinary customer" as far as the detailed operation of the missile and its vulnerabilities were concerned.

The question is "How far should the DRA continue to provide such services, and to whom?"

For the DRA, or any other organisation to be in a position to provide such services the two conditions set out above must be satisfied. In the likely event that the DRA has *not* been involved in the detailed design and development of the equipment, the contractor could probably provide the design capability and the DRA the trials and test facilities, providing that a UK contractor is the supplier. If the equipment is from a foreign supplier the only way that the MoD can be assured of such a support service is to commission a study of the design details and performance strengths and vulnerabilities of the equipment in question. The most suitable organisation for such studies is likely to be the DRA. There is already experience of such skilled and sensitive work within the DRA dating from the Falklands war.

The answer to the question then, is that the DRA is well suited to provide such expert support services to the MoD (or any other customer) but it is almost certain in the current and forseeable procurement circumstances that such support services would only be available in relation to equipment on which studies had been commissioned for this purpose. The potential value of such studies on equipment purchased abroad was well demonstrated in the Falklands and I consider it vital for the MoD to ensure that adequate studies are performed on any equipment against which defensive actions may have to be conducted.

The categories of customer expertise are set out in the evidence submitted by Mr J F Barnes.

Question 3.2

The conditions necessary for the successful transfer of technology from defence, or any other source, to the civil sector are:

(i) that the recipient should be in a position to make the investment to exploit the technology; plant, facilities, training;

(ii) make the investment in the design and marketing of a product to exploit the technology.

I believe that one of the reasons for the lack of success of DTE was the under-estimation of the costs involved in (i) and (ii) above particularly in the case of technology seen to be already mature in defence applications.

Question 3.5

To assess whether the DRA is more likely to succeed that DTE it is necessary to consider the precise aims of the activity. I believe that what the DRA can offer to the civil sector is access to a wide range of technology, design capability, analysis, assessment and computer modelling expertise and technical project management. It is not likely that work in the DRA will translate easily into marketable products for exploitation by the civil sector. Provided this limitation is recognised I believe the DRA can achieve a successful business operation in licensing and selling technology, pursuing research on items of "enabling" technology for customers in the civil sector and offering a high grade design service to firms which are not large enough to maintain an adequate range of design competence.

The Society of British Aerospace Companies Ltd.

Thank you for the opportunity to respond to the Committee's "Call for Evidence" document which you sent under a covering note dated 22 November 1993.

The questions posed have been considered in detail by a Working Group (WG) of the SBAC's Technology Committee, comprising senior representatives from fixed and rotary wing airframe constructors, engine manufacturers, and the avionic and mechanical systems equipment sectors. The WG's comments were subsequently endorsed by our Technical Board which is the senior, technical policy body within the Society.

The attached SBAC submission therefore represents a broad consensus of company opinion within the aerospace sector.

We have tailored our responses to the questions contained in the Call for Evidence. However, should the Committee require any elaboration on the issues raised or identify any supplementary questions they would like to ask as a result of this exercise, then please do not hesitate to contact me.

SBAC Submission

Below are the SBAC responses to the "Call for Evidence" document circulated under a covering note dated 22 November 1993. The responses have been constrained to answer the specific questions posed and, for convenience, have been grouped under the paragraph numbers used in the Call for Evidence document. More generally, the DRA has proved to be a source of valuable interaction with Industry in the past by providing a focal point for many aspects of aeronautical research. We would wish to preserve such an arrangement in one form or another for the future.

1. *The Defence Research Agency and its relationship with the MoD.*

1.1 From an Industry perspective, the DRA is very heavily dependent on the MoD from which it receives over 75 per cent of its income. Furthermore, its Framework document ensures that it is tasked almost exclusively only with work of direct interest to the MoD.

1.2 Industry welcomes any developments which would result in the improved cost-effectiveness of the DRA. Providing it is sensibly implemented, the imposition of commercial disciplines on the DRA offers the potential for obtaining better value for money. However, excessive commercial exploitation of the DRA's near monopolistic position would militate strongly against maintaining a close working relationship with Industry to obtain the best result from the combined research resources.

Under a system where Industry competes for secondary research topics within a given package, over-competitiveness could result in the DRA drawing in on itself and Industry increasingly losing visibility of the total package requirement. Such a development would inhibit Industry's ability to propose innovative solutions to meet the overall MoD requirement.

1.3 Industry is concerned that the year-on-year financial pressures of the DRA's new status will increasingly lead to priority being given to medium/short-term projects and the erosion of the capability and ability to mount long-term leading edge research. The danger is that the DRA's research strategy would be largely determined by the military's most pressing needs which are likely to emphasise the application of existing technologies rather than the creation of new ones.

1.4 Industry is not in a position to comment in detail on the MoD/DRA inter-action. However, whilst supporting package management as a concept, Industry is concerned that a too rigid application could isolate Industry from its ultimate customer, the MoD. Further, as mentioned in paragraph 1.2, Industry would no longer have full visibility of the MoD's requirements.

1.5 Although the requirement for secondary competition has been introduced, the DRA has retained a near monopoly position as controller, arbiter and provider of the vast majority of MoD research. There is some disquiet in Industry that this multi-role will place unreasonable expectations of objectivity on the DRA whilst attempting to satisfy increasing commercial pressures.

1.6 Industry is not in a position to comment on the process of formulating stragegy for the DRA and has no first hand detail knowledge of new thinking on HMGs defence and foreign policies. However, the recent past emergencies would seem to emphasise that flexibility, force augmentation and the political implications stemming from precision strike and anti-missile defence are all increasingly technology dependent.

Industry would expect some proportion of the savings made from reduced volume in defence spending to be re-invested in improving the quality of the Services' capabilities. The identification of key technologies as the focus for this investment would be a major step forward; Industry has already been active in attempting to identify key technologies under the DTI Aviation Committee NSTAP initiative and similar work being undertaken within the Defence Scientific Advisory Council (DSAC).

1.7 Industry recognises the importance of having a national technology source to provide non-research scientific and technical services to the MoD in times of emergency or conflict. However, the DRA is only one source of this advice. The defence industrial base is perhaps an even greater contributor of such services since it can provide not only technological expertise but also the productive means—providing the equipment has been procured from a UK source.

The DRA also provides the MoD and other government departments with technical services, such as project assessment. Continued DRA activity in these areas is generally supported, but Industry would be concerned were the DRA to attempt to expand its expertise as a commercial business. On the other hand, the increased commercial use of DRA facilities should be encouraged.

2. *The DRA's management, internal affairs and corporate strategy.*

2.1 The Industry view is that restructuring to maximise the synergy between research activities would be beneficial. However, cost driven rationalisation must be done in such a way as to preserve critical expertise and facilities in key areas, if the DRA is to maintain a pre-eminent role in defence research.

2.2 Industry considers objective rationalisation to be a logical and desirable outcome of the DRA's move to agency status. The rate of rationalisation should be governed by a balance between achieving cost savings and retaining a long-term viable research capability. Industry is not in a position to determine whether or not this balance is being achieved during the transition phase.

2.3 Both Industry and the DRA have a requirement for an appropriate share of the most intellectually able scientists and engineers. Industry would be unhappy if DRA's special position as a monopoly supplier to the MoD were to be used to prevent normal market forces applying to remuneration packages. We would expect normal industrial attitudes to prevail in recruiting, retaining and shedding staff.

2.4 Industry's understanding of Pathfinder is that it is a process which enables Industry to offer the DRA research ideas/concepts with the potential of providing innovative, more cost-effective solutions to the MoD's technology requirements than those currently existing within the DRA. This Industry understanding is significantly different from that implied in the question since Pathfinder in itself is not an opportunity for Industry to gain access to DRA research results.

The main benefit from Pathfinder, if properly managed, is that more research could be carried out in Industry and thereby provide a more direct route for the exploitation of the wealth-creating potential of such research. Generally, Industry is supportive of the principles of Pathfinder, but has had very little return on its investment in participation to date. The realisation of the potential of the Pathfinder initiative is entirely dependent on the benefits accruing to Industry, and it is too early to make a definitive statement on its future at this stage.

At a more detailed level, the timeliness of Pathfinder briefings, the timescale for submissions and the DRA monopoly position in interpreting MoD requirements, are all seen by Industry as areas requiring urgent improvement. In particular, Industry would be very concerned were Pathfinder to become the only, or even the main, forum in which Industry could discuss technologies with the DRA.

2.5 The Industry understanding is that it is the MoD who identifies the future defence needs and that the DRA role is to respond to those needs.

3. *The DRA's relations with Industry, Europe and the wider world.*

3.1 Industry believes that not enough is being done to line DRA research to wealth generation in either the military or civil sectors. Consideration of the potential for civil market exploitation, and hence UK wealth generation, should be given a high priority in establishing research strategy in close consultation with Industry. The commercial exploitation of defence research expenditure would give a better return on overall UK investment in R&T.

3.2 Industry is best placed to identify the market needs and opportunities for the exploitation of technologies. A fundamental requirement for successful technology transfer is, therefore, an appropriate involvement of Industry with DRA researchers at all levels and stages of the research/innovative process. The dissemination of information on DRA research programmes and improved accessibility to research results on a commercially viable basis, would be key ingredients for effective technology transfer.

3.3 The aerospace industry is seeking to establish an Aerospace Sector Panel within the Technology Foresight Programme. The aerospace industry would expect the DRA to make a strong contribution to such a Sectoral Panel in terms of both strategy and technology. Industry notes that the Chief Executive of the DRA is a member of the Technology Foresight Programme Steering Group.

3.4 A primary role of the DTI is to support UK Industry; hence, any DTI funding of DRA must be driven mainly by Industry research requirements. Recent DRA involvement with DTI has not had obvious routes by which Industry could benefit directly from the research results. DRA involvement in LINK projects has been severely constrained by the lack of dedicated funding and the rigidity of the research packaging system.

Industry's view is that the DRA/DTI linkage is weak but that it should be strengthened only where such linkage would directly contribute to wealth creation by the effective transfer of technology to Industry. As mentioned previously in Paragraph 1.6, the existence of national technology acquisition strategies in the civil and military areas would greatly improve objective linking between the DTI and DRA.

3.5 Industry does not perceive any void created by the demise of the Defence Technology Enterprises (DTE) since, from an Industry point of view, it failed in its primary objective. Industry would encourage the DRA to seek wider exploitation of the results of UK investment in technologies which are resident in the DRA, but such exploitation should be driven by the objective of maximising wealth generation within UK Industry rather than maximising DRA income.

3.6 It is Industry itself who must take the lead in any defence conversion and diversification within the industrial sector. The role of the DRA should be to be responsive to the needs of Industry during this process.

3.7 The DRA's primary role is to provide research and technology in support of the MoD. Industry would be supportive of the dissemination of DRA research results and technology to non-defence industries as part of a process designed to maximise wealth generation within the UK economy. The greater exposure of exploitable technologies outside the defence sector could provide the market pull for a wider range of dual-use research programmes. Ways of achieving this exposure could include the DRA holding a series of technology seminars for Industry in general.

3.8 Industry would prefer to work in partnership with the DRA in a stable environment. Such close collaboration would minimise duplication of effort and the time taken to exploit technologies thereby maximising wealth creating opportunities. However, such an arrangement is not compatible with a management system that uses minimum price as the main criteria for determining value for money, rather than one based on the more objective criteria of improved cost-effectiveness.

The Industry view is that there is ample scope for potential conflicts of interest with the DRA under a system where the DRA is manager, arbiter and provider of research in a competitive environment. Whether justified or not, there is an inevitable industry perception of bias towards the in-house provider under this régime. Systems are being developed to improve the arbitration process, but these are not as yet wholly acceptable to Industry.

3.9 Industry perceives a strong DRA involvement in determining UK participation in EUCLID and as a participant in EUREKA and the EC Framework Programmes with DTI funded assistance. Industry is wary of DRA increasing its involvement in research initiatives not directly related to defence technologies, without Industry being able to steer the research direction and objectives and without obvious routes for industrial exploitation of the research results.

3.10 The Industry perception is that the DRA is strenuously increasing its participation in European collaboration as a means of establishing alternative sources of funding. For its part, Industry is concerned that European collaboration should be entered into as a cohesive extension of national research strategy rather than solely as a source of additional DRA funding. Furthermore, the social aspirations reflected in some European programmes have resulted in UK technology being transferred to create new, or benefit existing competitors in an already crowded market sector. Similar disadvantages can result from DRA collaboration with non-European countries, particularly the USA.

3.11 Virtually all major competitor nations consider their defence industrial base to be a strategic asset. Consequently, they have developed defence technology acquisition strategies and equipment procurement policies designed to sustain and develop their defence industrial base. There is therefore a close relationship between the aims of these industries and their MoDs which enables the latter to negotiate for the maximum return for their industries from participation in collaborative research projects.

A major recent change of policy in the US has extended the influence of the Advance Research Programme Agency (ARPA) approach to government investment in research. ARPA has a small permanent staff and acts as a facilitator for managing research carried out with government funding in Industry. The role of ARPA is to assemble research packages based on Industry proposals and provide the project management expertise. ARPA is not a provider of research in its own right.

Whilst the above two approaches are significantly different in their structure, they both underline the commitment to industrial relevance and wealth creation as a strategic objective of other governments in support of their industries.

Letter From General Sir John Stibbon KCB OBE

I have only just been able to study your letter concerning Sub-Committee II's enquiries into the Defence Research Agency.

I retired from the Army in December 1991. My final appointment was Master General of the Ordnance with responsibility for the procurement policy of land based equipment and weapon systems. This brought me into fairly regular contact with the MOD research establishments and in my final months, a peripheral involvement in the proposals for setting up the DRA.

In view of my last appointment, I was embargoed until December 1993 by the Business Appointment Rules from taking up employment with Defence Industry. Consequently, I have had little involvement with Defence procurement and no contact with the DRA for the past 2 years. My knowledge of the DRA is therefore limited to its early inception and I have no factual awareness of its performance subsequently, either from an MOD or Defence Industry point of view.

Accordingly, I have had to limit my answers to your questionnaire to those areas where concern was expressed in the early days. Such concerns may well have been overcome subsequently.

1.3. An early concern was the status that a "commercial" DRA would be able to maintain with defence research establishments of other NATO countries, particularly the USA. As part of the MOD, the research establishments enjoyed a particularly close relationship with their counterparts in for example the USA and West Germany—both at corporate and individual establishment levels. Were partner nations' perception of the DRA's commercial status to handicap the previous close relationships and cross-flow of research information, it seems to me that any adverse change would affect the DRA's research strategy.

1.5. Market forces have undoubtedly come into play, necessitating considerable rationalisation of research establishments. At the stage I retired, concern was being expressed that the impending reductions were not fully taking account of MOD perceptions for the retention of research in certain areas and technologies. Subsequent discussion may well have resolved this but I would suggest that the way forward must be a continuous and dynamic dialogue with MOD to prioritise research areas and determine which technologies must be retained (Q1.6 refers). I assume this is now happening.

1.7. I consider that provision of scientific and technical services, both to the MOD and Industry, are an important aspect for the DRA, particularly in terms of project development trials. It seems to me that the DRA should be well placed to compete for such contracts with their laboratory and range facilities and an even-handed approach between MOD and Industry. Such contracts provide a reasonably stable revenue.

2.2. From the little I have been able to glean from Industry, initial disruptions have been overcome and the rationalisation is considered to have been logical and the pace about right. There remains some apprehension with regards "Chinese Walls" and confidentiality, but the Pathfinder programme is well known and generally welcomed.

2.3. Employment on research, particularly fundamental research, is not necessarily conditioned by pay. However at a time of national shortage of research scientists and good engineers, flexibility for buying-in is required. The freeing from set salary levels affords the DRA the ability to compete with Industry and the universities. It is difficult to see how the DRA can strive to become a centre of excellence without such flexibility.

3.1. In my opinion, MOD and its' research establishments were not good at seizing opportunities to translate defence research to the civilian market.In a sense, the role was not seen to be there. Civilian spin-offs should be of major interest and I consider the DRA is well positioned to take the initiative, within the constraints of sensible security precautions.

Letter from Professor J L Stollery CBE FEng, Head, College of Aeronautics, Cranfield University

Thank you for your letter dated 23 November. My apologies for not replying earlier but I have taken the opportunity to consult a number of friends and colleagues.

I will restrict myself to just a few points which are relevant to a number of the specific questions that your "call for evidence" document raises. The first concerns the quality of research. This is likely to drop because the emphasis is now on the cost of any research programme, not on its calibre. The whole business atmosphere that has been created with "work packages" and "package managers" emphasises the impression of cost domination. The staff within DRA now seem to be judged by how much money they can bring in, not by the quality of their research. The DRA is not alone in suffering from this disease, it is increasingly prevalent in Universities too!

My second point concerns the independence of the DRA from the MoD. The DRA's major customer is the MoD and in time of national emergency the DRA is expected to concentrate entirely (and quite correctly) on the MoD's needs. Full independence is therefore impossible. In my view it was a mistake to try to turn the Research Establishments into commercial enterprises. It has destroyed the trust that Universities and industry had in the RE's. Inevitably the DRA is now seen as a competitor and many people are now wary of even discussing new ideas with the Agency.

The only benefit that re-organisation has brought so far, is that the links with DTI have been strengthened. Discussions between DRA and the DTI now seem to be better focused and may lead to much more collaborative research that cuts across the civil/military divide.

I hope these few remarks are helpful.

Supplementary Memorandum from Professor J. L. Stollery

1.2 *Is the DRA's new status as a trading fund a help or a hindrance in its pursuit of its role as a provider to the MoD of the best quality research?*

This is a critical aspect of the DRA activities, that, as a trading fund comprising the various business sectors, its aim is to be "in profit". This encourages support of in-house DRA activities to maintain its income base, even though the University and Industry sectors can often offer a better and more cost-effective service.

Operating as a profit centre in this way means that the Universities and Industry see themselves as competitors to the same groups that are tasked with advising the customer (MoD) on research strategy. The obvious consequences are that some of these groups are no longer keen to keep the DRA staff fully informed of their true capabilities. In our own case, information on the hypersonic vehicle aerospace technology studies undertaken by us for ESA in collaboration with other European Universities, companies and Government establishments is not disseminated in detail to the DRA Establishments—we see our approach to vehicle design optimisation and performance characterisation as commercially sensitive.

In some DRA business sectors, the build-up of in-house capabilities has taken a larger slice of the cake and correspondingly reduced the monies available to outside groups.

Agressive attempts are being made by some elements with DRA to secure IPR and copyright in specialist software with a view to enhancing their commercial capabilities. It is our understanding that MoD PATS see industry as best placed to commercially exploit software products, indeed DRA has no marketing/sales experience. Commercial exploitation agreements vesting IPR in contractors seem to be the best approach.

If contracts are to lose future potential sales revenue which would come from shared IPR costs of development will rise.

We are still seeing a flurry of spending at year end to clear budgets. It is difficult to accommodate short-term seasonal spending within the general staffing constraints.

1.3 *How does the DRA's status affect its research strategy?*

A research strategy is concerned with the implementation of studies to support medium to long-term procurement goals. Bearing in mind that the development timescales of most major systems is at least 10 years and possibly 15 years or more, identification of research themes, their relevance to the UK projected requirements, management of the research activities and transfer of the technology into the appropriate sectors, requires an intimate knowledge covering a wide breadth of disciplines, ranging from the fundamental science understanding through to its implementation in design, manufacturing and system performance studies. It is our belief that in many areas the DRA does not have the requisite expertise to undertake such duties. Indeed, it is difficult to see how the DRA can operate effectively without a close involvement with the Universities and Industry by involving specialists from these organisations to assist policy making and formulate requirements. Doesn't this then conflict with the role of the Research Councils?

It is our experience that in some fields the DRA cannot be looked on as a centre of excellence, even those in which they are supposedly the focus for UK activities. Our view is that the UK interests are best served by an "old style" MoD establishment such as existed at RAE Farnborough in the 50's and 60's, employing the very best scientists and technologists, providing an R&D support service to the Government and Industry. Alternatively, but perhaps not as effective an option, the DRA should relinquish interest in "hands-on" science, their prime role being to manage a UK activity using appropriate University and Industry sectors not only to undertake the research but also formulate the research programme policy.

2.4 *Pathfinder scheme*

This is the scheme designed to encourage firms to contribute to the research activities by submitting unsolicited proposals to the DRA to the relevant package managers. A major concern is the protection of commercially sensitive information. We have a specific experience of commercial-in-confidence unsolicited proposal ideas being used as the basis for a competitive bid. In addition, in some areas views privately expressed by package managers indicate that some are unhappy with the Pathfinder approach on the basis that it may compromise their own activities if they already were thinking along similar lines.

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being regulated?*

A competitive situation is perceived to exist between various areas in industry and some groups within the DRA (and at a personal level, even between groups within the DRA). In many cases, the change over from MoD to DRA has not been viewed to have been successful in changing the role of some staff. Personal relationships between MoD and University/Industry staff built up during contract activities with the MoD still continue, even though competitive bidding for contracts is now the rule. Most of the problems in this area arise because of one or more of the following:—

(a) The MoD acquired and developed its capability from Government funding(ie the public purse), and this has been transferred over to the DRA trading activity. Capability includes hardware such as testing facilities and software in the form of scientific computer models. Many companies and Universities, including ourselves, provided commercially sensitive information to MoD for their use, on the understanding that it would be protected from commercial exploitation and would not be transferred to other companies. This capability is now being offered on a commercial basis in competition with industry and the Universities, and clearly gives DRA an unfair advantage. It should be remembered that, as MoD Establishments, great care was taken to ensure that individual companies did not benefit from their interaction with MoD Establishments that would have given them an unfair advantage. Such MoD knowledge or capability, where appropriate, was made available to all.

(b) Extramural contract specifications are in some cases not properly defined, in that they ought to fulfil a defined role within an overall research strategy objective.

(c) Proposal marking schemes appear in some areas to be somewhat arbitrary, allowing the contract monitor to bias the score achieved by a proposal to a favoured bidder.

(d) In some areas, competition is a hindrance, such as where capability maintenance or specialist support is called for, which usually will have involved a long commitment to a technical area. Unless specifications for work are carefully written to ensure that the appropriate personnel or groups are selected, in a small market place with limited resources, it is easy to lose specialist capabilities by inappropriate bid selection. In many ways, the limited UK market does not allow for effective completion since key technology areas are not supported widely, unlike in the US where both the funding levels and numbers of potential suppliers are much more significant. There is only one main military airframe manufacturer in the UK, for example. A more competitive market could be more effectively established within the EC as a whole.

(e) Competition should not be used as an excuse to penalise companies for unsolicited novel ideas. Single tenders are still valid where a unique expertise or organisation of work program can be shown to rest with the contractor. If unsolicited ideas are not protected then industry will feel that it is not a commercially viable option to discuss new ideas openly with DRA, and will respond only to existing work specifications. This must limit the quality of the science being undertaken on behalf of MoD. We have direct experience of DRA groups who have ignored our IPR and Copyright, and who have also used company proprietary information on proposed R&D activities to make successful bids for funding to undertake these activities intramurally. In one case, such information has been used in detail as the basis for a specification for a competitive bid from industry.

(f) There is currently no satisfactory mechanism in place to ensure that specifications for competitive bids are properly disseminated. Publication in the MoD Contracts Bulletin only occurs when the bid value is greater than £250,000 and this tends to apply mostly to hardware procurement items. Since many scientific contracts tend to be of lower value, it is left to the discretion of the DRA contract monitor and issuing office to decide who to approach for bids. We have knowledge of instances where we have been omitted from the list of bidders, even when our capability in the field is recognised. It is our view that the hidden nature of relatively low value contracts discriminates against companies and Universities, and is being used by some DRA staff to prevent open competition and to control the growth of potentially competitive (to DRA) expertise centres. This situation can simply be resolved by issuing a list of all specifications for bids at regular intervals (say weekly) to be posted in public. In the US, this is done at the visitor entrance of the various Government Establishments.

Letter from HM Treasury

You wrote to me on 27 January, asking for a Treasury memorandum on a list of questions which you enclosed with your letter.

We do not consider that it would be appropriate for the Treasury to give evidence on any of those questions, because all concern matters for which the Ministry of Defence has prime responsibility. Although the

Treasury has responsibility for Government Accounting guidelines and the rules by which Departments account for votes, agencies and trading funds, it is the Departments who are responsible for the application of those rules.

I am copying this letter to Ms Field, the Select Committee Liaison Officer in the Ministry of Defence.

Supplementary Letter from HM Treasury

You wrote to Phillipa Todd on 16 March asking for a memorandum on a list of questions which you enclosed with your letter.

I attach a memorandum in response to your questions.

Please note that the annexes referred to in the draft instrument delegating the setting of pay and pay related conditions of service in the DRA to the Secretary of State for Defence attached to the memorandum are not enclosed. They are long and detailed and you may feel they are not relevant to your enquiry, though we will of course provide a copy if you wish.

1. Noting the statement in the Treasury's memorandum that "the Treasury has responsibility for Government Accounting guidelines and the rules by which Departments account for votes, agencies and trading funds", may we have a statement of what those guidelines and rules are? We would welcome, additionally, details of any special provisions that might apply in the case of MoD or DRA. (If the full body of guidelines and rules is excessively bulky, a summary statement would suffice initially.)

Guidance on the accounting arrangements for agencies and trading funds is set out in Chapter 17 of Government Accounting (copy attached (*not printed*)). The Treasury's Treasury Officer of Accounts Group (TOA) are presently revising and expanding this guidance with a view to publishing it in the next couple of months. The revised guidance should be in a complete state shortly after recess, and we will send the Committee a copy then.

The guidance applies to all trading funds and there are no special provisions which affect DRA. However, the basis on which funds are advanced or lent in a particular case may well be subject to terms and conditions set by the parent department of the trading fund. In the case of the DRA, for example, the Treasury would expect MoD to specify precisely the purposes of the expenditure, whether for rationalisation, working capital or a specific research task before making any payments, and monitor progress against the DRA's corporate and business plans.

2. Does the Treasury agree with the statement made in evidence by MoD that "Treasury rules mean only MoD can be DRA's banker".

Under Section 1(4) of the Government Trading Funds Act 1973, as amended, an Order establishing a trading fund must designate either the National Loans Fund or the responsible Minister as the authorised lender of all issues to the fund by way of loan. As a matter of policy the Treasury considers that in the case of a trading fund which is part of a Government department the authorised lender should be the responsible Minister as the trading fund is accountable to him.

As MoD pointed out in their memorandum these arrangements do not, of course, apply to payments to DRA for services provided to third parties. DRA can accept payments for services provided from MoD or any other body in the public or private sector including, for example, other government departments such as DTI or some other Next Steps Agency.

3. Would the Treasury accept the apparent implications of their letter that:

- *(i) they would not restrict MoD from granting DRA permission to invest in any facilities that MoD felt to be appropriate;*
- *(ii) they would not restrict MoD and DTI from funding jointly any activity that they considered to be of mutual value; and*
- *(iii) the prices charged by DRA for its services, and remuneration paid to its employees, are matters for MoD and DRA alone?*

(i) Approval for DRA to invest in specific facilities is primarily a matter for MoD taking account of its current and future research and development needs and whether the proposed facility requested gives value for money. There are, however, Treasury delegated authorities for specific types of expenditure eg works or information technology, and if MoD wishes to incur expenditure in one of these areas in excess of these authorities a case must be made to the Treasury demonstrating value for money. These authorities apply equally to the DRA as it is part of MoD.

(ii) there would be no objection in principle to MoD and DTI jointly financing a particular DRA research project if both Departments considered this represented good value for money given other competing priorities for the use of public funds and was consistent with their objectives.

(iii) In common with other trading funds, Government Departments, Next Steps Agencies, NHS bodies and non Departmental Public Bodies, DRA are required to follow the guidance set out in the Treasury's Fees and Charges Guide, taking account of the financial targets set by MoD.

The position on the remuneration of DRA employees is set that the Treasury will very shortly be delegating to the Secretary of State for Defence authority for setting pay and pay-related conditions of service in the Defence Research Agency. The terms of this delegation are set out in the draft delegation instrument attached to this memorandum (*printed below*).

Draft

DEFENCE RESEARCH AGENCY: DELEGATION OF PAY AND PAY RELATED CONDITIONS OF SERVICE TO THE SECRETARY OF STATE FOR DEFENCE

I am authorised by the Lords Commissioners of the Treasury to delegate to the Secretary of State for Defence authority to set the terms and conditions of service of all the staff in the Defence Research Agency below Grade 3. For the purpose of this delegation "terms and conditions of service" means all the items listed in article 5(a) of the Civil Service Order in Council 1991, with the exception of *retirement* and *redundancy*, the *reinstatement* and *re-employment* of persons in the Service and the *redeployment* of staff (below Grade 3) between departments.

2. This delegation is made in the presumption that the functions delegated to the Secretary of State for Defence will be exercised, with effect from the date in paragraph 4 below, by the Chief Executive of the Defence Research Agency.

3. This delegation is made subject to the following conditions:

(i) the Defence Research Agency must continue to comply with the Civil Service Management Code sections listed in the Annex to this letter;

(ii) changes made by the Defence Research Agency to the terms and conditions specified in paragraph 1 must provide value for money and be made in a way which does not jeopardise essential public expenditure safeguards.

4. This delegation comes into effect on 1 April 1994.

5. The CCSU and JCC have been given the opportunity to comment on the principles of this delegation and the conditions attached to it.

Memorandum from Vickers Shipbuilding and Engineering Ltd (VSEL)

VSEL is pleased to provide an input on this important subject. We have submitted a response on those aspects of greatest relevance to our business, using the framework in your call for evidence.

The relationship between the MoD, the DRA and private industry is evolving quite rapidly to reflect the changing defence priorities and procurement policies. A new framework is required in order to ensure that the Government achieves the best return on its investment in the DRA, which will continue to be a unique defence related asset.

1. THE DEFENCE RESEARCH AGENCY AND ITS RELATIONSHIP WITH THE MOD

1.1 *How independent of the MoD is the DRA?*

The MoD is the DRA's primary customer providing 90 per cent of its revenue for the Financial Year 1992–93. Agency status introduces more commercial disciplines into the organisation's operations which are beneficial to both the MoD—as a customer—and the DRA itself—as a supplier.

Initial signs of these benefits are already evident, however the magnitude of and associated timeframe for these changes are significant. The previous culture is still deep-rooted and the potential efficiency gains are unlikely to be achieved without a pro-active change process involving a further injection of commercial experience at all management levels.

1.4 *How has the MoD's system of Research Package management evolved in the light of the Ministry's own New Management Strategy (NMS) and the movement of the Agency Towards Trading Fund Status?*

The current position appears to have three areas for potential concern:

(i) Accountability of Package Managers.

(ii) Independence of advice to MoD as a customer.

(iii) Competition for work between the DRA and private industry—*see Question 3.8.*

The MoD funding agencies require support in formulating needs and for the project management of its resources. Under current arrangements the DRA's roles of customer and supplier have the potential for conflict. In particular the accountability of the Project management function of DRA Package Managers is ambiguous and this in turn undermines their independence when the DRA compete for packages against private industry—*see Question 3.8.*

More precise definitions of responsibilities and accountabilities as customer/supplier—with minimal competitive conflict of interest—would improve the efficiency of the whole process and provide benefit to all parties.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

The impact on future relationships with private industry is condensed under two categories:

(i) The potential for conflict between the DRA and industry when competing for MoD work—*See Question 3.8.*

(ii) The potential for conflict in roles for the DRA as a supplier of advice to both the MoD(PE) and industry in its role as a Prime Contractor to the same MoD(PE) customer.

The MoD(PE) policy of devolving greater accountability to private industry through Prime Contractorship leads industry to seek the best sources of advice. A valuable knowledge base inevitably (and rightly) resides with the DRA and will continue to do so.

The DRA's customers in industry and MoD all wish to have access to this knowledge and advice, however these customers may have their own contractual customer/supplier relationships with the potential for the DRA to be unable to function effectively in either role.

In addition the MoD(PE) policy of maximum effective competition creates three further issues:

(i) The need for the DRA to retain full openness and impartiality to all prospective industry Prime Contract bidders in the pre-competitive phase of the procurement.

(ii) The involvement of the DRA by MoD in the setting of requirements and assessment of industry bids for Prime Contracts in which they may themselves be sub-contract bidders.

(iii) The prospect that the DRA will be in competition against other parts of private industry for some aspects of the Prime Contract implementation and thence restrict access to their know-how in the formative phase of a project.

The ultimate aim for the MoD is that the DRA's expertise should be available in a full and timely manner so as to maximise the cost effectiveness of the systems that its Prime Contractors deliver.

The unique position of the DRA requires the creation of a framework that will allow the MoD's return on investment in the DRA to be maximised in terms of systems delivered by private industry. Access to the DRA's expertise to both the MoD(PE) as customer and the industry Prime Contractor as MoD(PE)'s customer must be arranged so as to ensure full and timely information flow.

These arrangements need to ensure that contracts between MoD(PE) and industry are not undermined by any separate contracts with the DRA, and that the MoD's access to DRA advice is not prejudiced by the contractual conditions entered into between the DRA and private industry.

3. THE DRA'S RELATIONS WITH INDUSTRY, EUROPE AND THE WIDER WORLD

3.8 *How is the matter of potential competition between the DRA and private industry being handled? Does any scope exist for potential conflicts of interest or unfair competition, and how are these being approached?*

Two aspects require further consideration:

(i) The relationship between the MoD, DRA and private industry in its role as Prime Contractor to MoD(PE)—this is addressed in response to Question 1.

(ii) The relationship between the DRA and private industry as both supplier to the DRA and potential competitor for work to either the MoD's Package Manager or an industry Prime Contractor.

The DRA is an important customer of many Small to Medium sized Enterprises (SME's) which have historically undertaken the development of much of the DRA's technology base.

The move towards competition between the DRA and these SME's to both MoD Package Managers and industry Prime Contractors will put this relationship under severe pressure and fundamentally change DRA's existing attitude to these SME's which currently provide a valuable element in support of the nation's defence and a vehicle for commercial exploration—including exports.

Competition is a key Government policy and this needs an appropriate framework within which the DRA and private industry—as both customer *and* competitive supplier—can operate both effectively and fairly.

Memorandum from Vosper Thornycroft (UK) Limited

Thank you for your letter of 22nd November enclosing the Committee's call for evidence for its enquiry into the DRA.

We would like to make the following points on the questions raised:

1.6 The shift in focus on defence policy from the East–West confrontation to more regionally based disputes should result in a changed view of future Naval requirements. An example of this could be that increased out of area operations will lead to a requirement for more corvettes and light frigates and a reduced requirement for large anti-submarine frigates. We would hope that the DRA would be involved in such strategic thinking.

2.4 We believe that the Pathfinder programme is worthwhile. We are submitting a bid for an R & D project on GRP superstructures for warships (including design, manufacturing and testing). We see this Pathfinder project as a good example of the avoidance of the type of R & D duplication that has taken place in the past and an opportunity for the MoD to benefit from technology developed by Industry.

3.1 From our stand point we doubt whether enough is being done to link DRA's defence orientated concern with civilian projects. We believe that there are many potential non-defence spin-offs which should be included in the Defence Research Programme but we have seen little of this happening to date.

3.2 A key condition necessary for the successful transfer of technology from the defence to the civilian sector is the need for industry to be kept aware of the emerging technologies. We believe that not enough is being done to ensure that companies who are exploiting the new technologies are being made aware of what is becoming available. We also accept that perhaps industry could be more active in unearthing the necessary information.

Memorandum from Westland Group plc

The Committee asks us to submit comments where we have an interest.

Westland endorses the detailed SBAC responses to questions which are not commented below. We have selected a limited number of questions on which we would like to make points.

1.5 *How will the DRA's new status affect its relations with the MoD, other Government departments and private industry?*

We perceive the new status of the DRA as a move in the right direction. The DRA has to bid for funds from whatever source they can gain these funds.

From an industrial point of view the DRA appears to have two objectives.

The first objective is to supply the Ministry of Defence with expert advice with regards to the direction of new relevant technology and in the preparation for and the evaluation of major procurement. It has a parallel role in preserving centres of excellence in operational analysis for use by the Ministry of Defence and possibly for use by industry.

The second perceived objective is to maintain a research capability.

We have no comment with regards to what we see as the first objective but we do have comments on the second objective. The DRA's research capability requires very considerable funding not only for the cost of the research programme but also for the capital cost of major items of plant and equipment in order to carry out the research programmes. The Ministry of Defence is and indeed should continue to determine what limited amount of funding is to be made available for research which could then be carried out. It is difficult to assess how much money should be spent on what areas of research. There is a tendency to perpetuate areas of excellence which are difficult to balance against real need.

Logically the research can be carried out in either the DRA or other Government research establishments, Universities or industry. The primary basis for a decision as to whether research should be carried out is usually sensibly based on the determination as to where the research could be done best and the cost effectiveness of the establishment chosen. Poor research is worthless and good research can be sustained because it needs to attract the best minds.

Having made that point the most important issue for national consideration is how that research will subsequently be brought to some useful purpose. Research carried out in a University generates a centre of knowledge which improves the quality of learning and which can readily be translated into knowledge held by a broad number of individuals.

In our opinion it is intrinsically difficult for research carried out in the DRA to be brought to commercial fruition. Westland has had considerable success in collaborative research with the DRA (or its predecessor) which has been brought to the market-place (for example the British Experimental Rotor-blade Programme and the Active Control of Structural Response Programme, which has produced a step change in the reduction of helicopter vibration). Research carried out in industry is very likely to be translated into a valuable product or service. Industry is generally speaking well organised to sustain its technical capability for whatever market it wishes to address and to relate its research development and product policy to its knowledge of markets. The bringing of technology to the market-place is the prime function in businesses orientated to making profit through technical innovation.

We would argue that when the Ministry of Defence and other Government organisations determine that funds should be spent on research that they not only choose the best location for this research in terms of excellence but that also bear in mind the arguments mentioned above. Universities or industry alone or in collaboration with the DRA should be preferred for research in areas where exploitation is sought.

1.6 *We would like to pick some points from this long question.*

There are certainly some areas which can be and indeed have been identified by the Ministry of Defence where the country would be well advised to continue to spend on research and development. These areas are obviously those where the technical investment can be translated into weapon systems that are noticeably superior to those of our potential enemies both so that we can use them and so that our potential enemies know that we have such capabilities.

It is our opinion that it is up to the Ministy of Defence to continue to allocate funds to those capabilities and the Ministry of Defence should be, and to the best of my knowledge are, responsible for ensuring that these technological capabilities are sensibly retained within the United Kingdom wherever it is reasonable and cost effective to do so. The allocation of funds to the DRA or to Universities or to industry can be determined by a range of considerations including those included in our answer to Question 1.5.

1.7 *The DRA like its predecessor organisations, has at its primary role the provision of research services to the MoD. In the past, however, the defence research establishments have also provided other (non-research) scientific and technical services to the MoD (significantly so during the Falklands and Gulf conflicts), as well as to other Government departments and private customers. How far should the DRA continue to provide such services, and to whom?*

The DRA should attempt to market its services to whomsoever will pay for them. In attempting to do this they will have to bear in mind constraints placed on them by the various suppliers of funds who may not wish for information paid for from their funds to be made available without appropriate constraints. Constraints that come to mind are those of National security and competition. This issue is managed by Universities, for example, where they carry out funded research for drug companies.

2.3 *What are the implications of the new regime's freedom to set salary levels in order to recruit and retain specialist staff, and how capable is the DRA of recruiting the best staff? What constraints and freedoms surround the employment of staff, and can the management retain the ablest staff and shed the least effective and those unable to adapt to change?*

We believe that the recruitment of the best staff to a research agency is predominantly determined by the quality of the work that the agency will be carrying out and the facilities that will be made available to the research staff. Salary levels will have to be acceptable to but are not the dominant factor in recruiting and retaining the most able staff.

3.1 *Is enough being done to link the DRA's defence-orientated concerns with civilian projects, and should civilian spin-offs be a major concern for defence research?*

We believe that the DRA will find it relatively difficult to establish a large volume of funding from companies operating in civil markets although they should obviously attempt to attract such funds. If the Ministry of Defence require less defence research in certain areas and if in those areas it is unrealistic to expect viable funds from civilian projects then the resource should be cut on a properly planned basis.

3.2 *What are the conditions necessary for the successful transfer of technology from the defence to the civil sector?*

It is difficult to transfer technology from defence to the civil sector and generally will only occur if a proper industrial organisation which trades products or services in the market-place has a realistic and determined business plan which properly manages research, development, manufacturing and marketing as closely inter-related activities.

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